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This Week in The IRON AGE

Vol. 156, No. 21 May 31, 1945

Editorial

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Technical Articles

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Features

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News and Markets

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With the fall of Germany we recommend—

Reduction of Excess Inventory

We realize full well that it has been difficult to get certain kinds and sizes of steel quickly from stock—however, the situation is improving. With steel moving from our plants in record volume, sizes may not always be in balance. But Ryerson stocks are being augmented daily and continue as the nation's largest.

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RYERSON STEEL

The IRON AGE

ESTABLISHED 1855

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May 31, 1945

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Left Hand and Right Hand

AS long as we stick to fundamentals we can't go wrong.

The navigator sets his course by stars and compass and heads straight for his destination. The railway switch system keeps a train bound for San Francisco from wandering to New Orleans. The radio beam brings the flyer home when the ground is hidden by fog or intervening clouds.

Too bad we can't always follow such fundamentals, or rather do not do so, in national policies affecting our economic welfare.

Sometimes we do and sometimes we don't. In the latter case the usual cause is that in the pursuit of detail we lose sight of relationships to main objectives.

Is there such a thing as a main objective on which all can agree? I think so. Whether left or right, liberal, conservative or whatever anyone may be except a plain, unvarnished "nut," we can all agree on one thing, namely, the best for the most.

No one will deny that the best for the most, in a national economy comes when employment is good, wages are good and business is good. These things are good in an expanding economy when ideas are encouraged which will germinate new products and better methods of doing things; when new capital flows freely to irrigate the new businesses and the old ones and make them grow and thus multiply jobs and purchasing power just as the rains multiply the harvest.

This matter of irrigation, capital irrigation, is mighty important. You have to plant money before you can reap jobs. It costs a minimum of some $5000 to buy the tools to put one additional man to work in our mechanized industries and sometimes more than that.

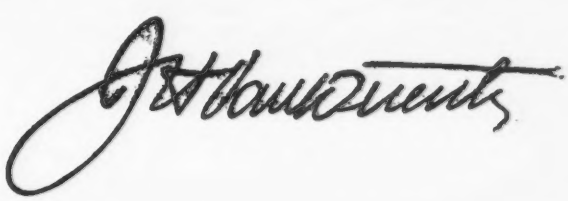
Our government wants private industry and business to make the jobs that make the things that people buy and sell. But strangely enough, while one hand of Uncle Sam is stretched out to help this purpose, his other hand is working against it. The injunction: "Let not your left hand know what your right hand is doing" is not a good one for government to follow.

Uncle Sam, with his right hand, is getting ready to help business finance employment through reduction of corporate taxes. The concern that makes a million dollars and has $900,000 of it taken away hasn't much left to make new jobs at $5000 per. So the tax authorities are pretty much agreed that after Japan is licked, the maximum corporate profit tax will be 25 per cent. That will be helpful.

But on the other hand, no matter how much irrigation you supply to a field, you won't get a good harvest if government should say to you: "So much shall you raise but no more." And that is just what it is doing and preparing to do more of with respect to curtailing jobs, wages and growth through certain international trade agreements.

These agreements are intended to fix quotas between nations for the production of certain commodities. Wheat, cotton, oil, rubber are on the contemplated or already executed list. That means inevitably a strict division of the going business among present producers. And that in turn means the prevention of new enterprise and the limitation of the existing ones.

Inevitably, if this principle is accepted, it will be extended eventually to what *you* make or buy. And if it is, all the tax reduction that Uncle Sam can make won't keep us out of that same state socialism that ruined Germany.



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BARS FLOOR PLATE PILING PLATES RAILS REINFORCING BARS SHEETS STRIP STRUCTURALS TIN PLATE TRACK ACCESSORIES

NEWS FRONT

Present plans are for all light plane manufacturers in this country to get off a simultaneous start, with limited production beginning in September.

Cracking in arc welded SAE 4130 steel is believed to be caused by numerous ctors including chemical composition, hardenability, carbide size and distribu- on, austenite retention, hydrogen absorption and the development of internal oling stresses, studies conducted by OPRD suggest.

Resulting from these researches on the crack-sensitivity of SAE 4130 is a test ocedure consisting of the deposition of a circular bead of 1-1/4 in. outside ameter on a 2x2x1/8 in. preheated specimen held in a copper jig. Immediately ter breaking the arc, the specimen is quenched.

The Mare Island Navy Yard will go on a three-shift basis to accommodate its pair work, now 15 per cent heavier than can be handled there.

Henry Kaiser will be able to borrow $52,000,000 from private banks in Cali- rnia to provide facilities for making tinplate, light sheet metal, a pipe mill d other improvements essential to reduced costs of operation. The Bank of erica is believed to have tentatively assumed this additional undertaking.

Kaiser has already paid to RFC $8,600,000 plus $8,700,000 through earnings om Kaiser shipyards.

Non-integrated steel companies are seriously considering an appeal to the ergency Court of Appeal on the recent price increases granted by OPA.

The increase allowed does not cover their losses brought on by the high cost raw materials, amortization of emergency war facilities and the adjustment of ge inequities.

The AAF plane cutback of 17,000 units per year announced this week is ought to be the first "realistic" appraisal of post V-E Day needs for one of e armed services. Layoff of 200,000 workers in aircraft assembly and 250,000 re in component production will follow.

War Department has held off from announcing as forthrightly other munitions tbacks which have been effected, and is currently involved in a debate with MR Administrator Vinson, who feels that heavier cuts should be made before e new budget is submitted.

The CIO-USWA has abandoned its wartime policy of not organizing foremen, ng-leaders, and straw bosses. These men, without authority to hire and fire, ill be the subject of an intensive organization drive.

A big heavy ammunition container program may fill plate schedules which ve promised to evaporate by July 1. This program will use about 350,000 tons 3/16-in. plate in hermetically sealed welded boxes to replace critical lumber, d improve the delivered condition of material for the Pacific.

Allocations to companies for the 200,000-plus passenger cars to be built is year are expected momentarily. They are to be based on historical production erages and for the leading producers will approximate the following: General tors, 90,000; Chrysler, 45,000; and Ford, 40,000.

First pre-termination agreement with an integrated steel company will obably be with American Rolling Mill. Pricing policies in general on all such greements will be on the basis of OPA ceiling prices if the negotiating mpany so desires, if the company can prove that such prices do not provide re than a "fair profit".

The RFC steel plant at Massilon, Ohio, has been placed on the market for le by that agency. Now operated by Eaton Mfg. Co., Cleveland, the plant is oducing bullet core steel rods. Interested firms have been given until ne 23 to make contact with the RFC.

A new method for determining moisture in electrode coatings recently adopted the Arc Mfg. Co., Ltd., England, makes results available in 15 to 35 min. hese tests can be carried out by unskilled persons.

Moisture determinations are carried out and the drying oven used in the con- uct of the test contains an automatic balance so constructed that samples can be eighted without being removed from the oven.

Improving the Weldability of High St

By S. L. HOYT, C. E. SIMS
and
H. M. BANTA
Battelle Memorial Institute

THE application of metallic arc welding to the fabrication of low-alloy steel of the hardenable type has presented problems which did not exist or were not serious when welding was conducted by the oxyacetylene procedure. The more drastic heating and cooling rates developed by the metallic arc promotes the formation of a narrow, hard zone in the base metal adjacent to the weld bead. In the case of low alloy, high strength steel, this zone is extremely hard and is especially susceptible to cracking. While this type of cracking may be minimized or eliminated by preheating and postheating, this procedure involves additional operations and expense, the results of which are not always consistent and often lead to warping difficulties which cannot be tolerated. In such a situation, the carbon and alloy contents must be reduced at a sacrifice in strength or an increase in weight.

Obviously, lightweight structures of high strength are most advantageous for many ordnance and especially aircraft applications. For the construction of air frames and engine mounts such steels as SAE 4130 and NE 8630 are used. These steels must be preheated and sometimes postheated as a prevention against cracking which is occasionally encountered in some lots that are especially crack sensitive.

Experience has demonstrated that different lots of SAE 4130 steel may have widely varying crack-sensitivity characteristics, that is, the tendency for cracks to form and propagate in the hard region adjacent to the weld bead. This inconsistent behavior has been more frequently observed in this grade largely because of the large quantities of SAE 4130 fabricated by the aircraft industry.

In the past, no one has understood the variation in crack sensitivity of different lots of a single grade of steel, although numerous speculations have been made, consequently the producers of this class of material have been unable to set up all the controls which are required for uniform, satisfactory response in welding. Therefore, it appeared that a thorough study of this problem would assist steel producers and fabricators to meet the demands of aircraft and ordnance manufacturers.

The first step in this investigation concerned the development of an appropriate test. This phase of the program was substantially aided by the availability of three pairs of commercial SAE 4130 sheet stock, each pair quite similar in all respects with the exception of a wide difference in crack sensitivity. General information concerning these steels is shown in Table I.

FIG. 1—The first type of jig used for making circular bead test. It consists of two copper plates 4 in. square by ½ in. thick with a 1¾ in. diameter hole tapering to 1¼ in. located in the center of each plate.

Crack-Sensitivity Test

After investigating a number of possibilities, a test procedure was developed which consists of depositing a circular bead of approximately 1¼ in. outside diameter on a 2 x 2 x ⅛ in. specimen held in an appropriate copper jig as illustrated in Fig. 1. The jig and specimen assembly are preheated to 100 deg. F., measured by means of a thermocouple in the jig. After allowing sufficient time for the specimen to reach the temperature of the jig, the bead is started, depositing the metal in a counterclockwise direction. The circle is completed in approximately 20 sec.

The electrode selected for the initial test was a 5/64 in. Wilson No. 520. Negative polarity was used with a power input of 50-55 amp. at 24 to 26 volts.

Immediately after breaking the arc, the specimen was quenched by filling the opening in the upper half of the jig with water. After 20 sec.,

igh Strength, Low Alloy Steels

. . . A study of cracking phenomena in SAE 4130 steel suggests that the origin of cracks is associated with the chemical composition and hardenability, carbide size and distribution, the retention of austenite and subsequent transformation at or about room temperature, the absorption of sufficient hydrogen and the development of internal cooling stresses. Development of a crack-sensitivity test is described and temperature-dilation curves are analyzed in the first part of the article, which was based on an investigation undertaken by the Battelle Memorial Institute at the instigation of the Metals and Minerals Branch of the Office of Research and Development, War Production Board, and the National Defense Research Committee. It is identified as project No. W-127.

the cooling water was removed by compressed air jet and the specimen removed from the jig after another 20 sec.

Using the above described procedure, 16 tests were made on each of the two steels Nos. 557 and 581. Within 24 hr. after welding, all of the specimens from steel No. 581 developed large cracks on the side opposite the circular bead. These cracks were found to originate in the hard zone adjacent to the weld and propagate through to the back of the specimen. No cracks were found on the backs of any of the specimens from steel No. 557, indicating that the test was satisfactory for distinguishing crack-sensitive from relatively insensitive material.

To meet the need for a truly quantitative test which would distinguish between various degrees of crack sensitivity is obvious, a different approach was tried. The circular bead test was made as before and after standing at room temperature for 24 hr., the specimens were drawn at 1050 deg. F. for an hour. The bead side of the specimen was then surface ground removing all of the bead together with one or two thousandths of the specimen. The object of the 1050 deg. F. draw is to eliminate any possibility of producing fine cracks in the hard zone during grinding. After grinding, the specimens are Magnafluxed, and the length of the cracks in the hard zone measured (see Fig. 2). Results of these tests made on steels Nos. 557 and 581 are summarized in Table II. It will be noted that the crack-sensitive Steel 581 developed an average total crack length of 391 deg. per specimen as compared with 133 deg. for steel No. 557.

In additional work, it was soon observed that the extent of cracking in a given steel varied from day to day, although welding conditions were maintained as constant as possible but results obtained from six or more specimens welded consecutively were reasonably consistent. This difficulty was overcome by the use of a control steel. The control was assigned an arbitrary value, and all unknown steels were compared with the control specimens which were welded along with each group of material tested. An explanation of the mathematical procedure for evaluating the crack-sensitivity test results is included in the appendix.

A statistical study of a large number of crack-sensitivity tests leads to the conclusion that a minimum of six tests is required in order to obtain a satisfactory degree of accuracy. All crack-sensitivity determination in this report was based on six or more tests, generally six.

In Table II steel No. 557 has been selected as the control steel for this investigation and assigned a rating of 1.00. Values lower than 1.00 indicate a more sensitive steel than the standard; values greater than 1.00 indicate that the sensitivity is less than that of the control.

Jig Design

In subsequent use of this test, it was found that in the case of extremely insensitive lots of SAE 4130 steel and especially NE 8630, the test conditions were not drastic enough to produce cracks in the specimen. To make the test more severe, ice water was used for quenching. The testing procedure was further improved by

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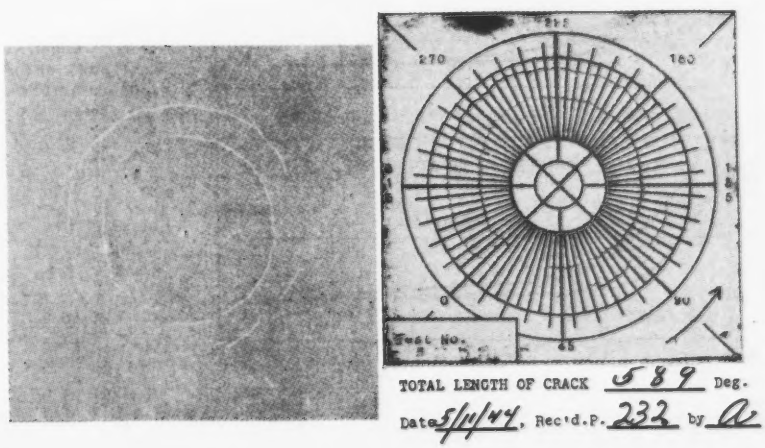
FIG. 2—(Left) Crack-sensitivity specimen after Magnafluxing. (Right) Record card with scotch tape transfer of cracks.



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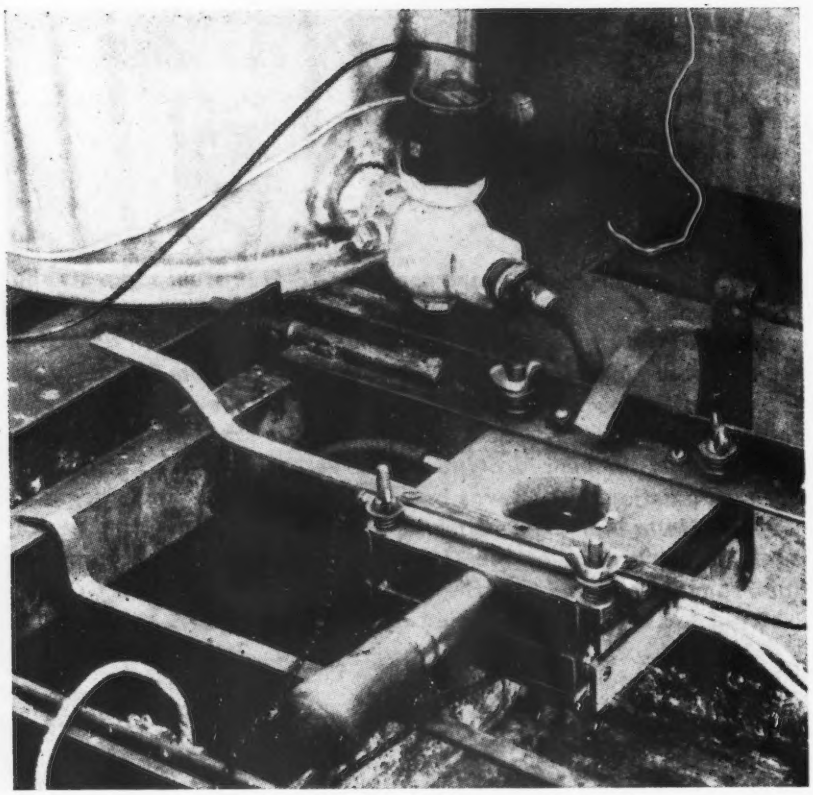
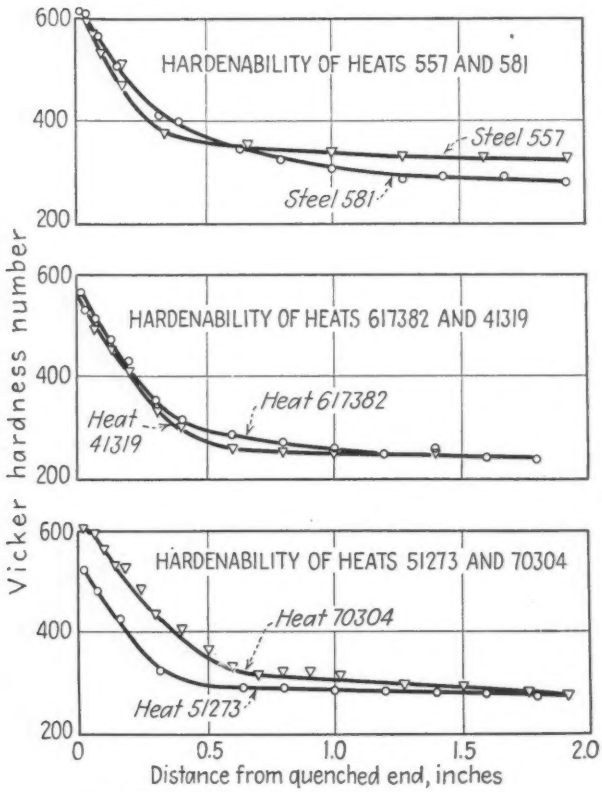


FIG. 3—Hinged water-cooled jig in position for welding. The solenoid valve shown above the jig, together with a simple control system actuated by the thermocouple extending from the lower right of the jig, regulates the flow of water to maintain a constant temperature. The specimen is dropped from the jig into the quenching water below by pulling forward simultaneously the two wing bolts on the front of the jig.



NOTE:
(1) Split Jominy bar
(2) Held at 1580°F. for 1 hr.
(3) Quenched as standard Jominy

FIG. 4—End quench hardenability results on three pairs of SAE 4130 commercial steels.

the use of a hinged jig as shown in Fig. 3. Upon completion of the weld, the jig is tripped allowing the specimen to fall directly into the quenching medium below. This arrangement produces a more drastic quench in addition to giving better control of the time interval between completion of the bead and quenching.

In order to maintain constant preheat conditions from test to test, the jig is kept cool with a simple thermostat which controls the flow of cooling water to the jig. This system will keep the jig temperature within + 5 deg. F. of the selected temperature.

A study of the possibility of adapting the crack-sensitivity test to gages other than ⅛ in. proved that the test was not applicable to lighter sections, apparently because they were not sufficiently rigid to allow the development of crack producing stresses. Work on heavier gages revealed that it was necessary to increase the electrode size and current as the gage of the test specimen is increased, in order to obtain a uniform degree of cracking. The procedures finally adopted for making circular bead tests on 2 x 2 in. specimens ⅛, 3/16 in. and ¼ in. thick of commercial SAE 4130 steel, are shown in Table III.

Magnetic measurements made at intervals from 30 min. to 6 days after quenching specimens of SAE 4130 steel from above the critical temperature showed a gradual rise of 0.34 per cent in the ferritic induction. This change presumably indicates the decomposition of non-magnetic austenite into martensite. While this measurement is not quantitative, it does indicate that the extent of the transformation is quite small.

The hard zone in welded specimens of No. 581 steel was examined with the X-ray using a modified Debye procedure. Austenite lines were readily found in diffraction patterns of recently prepared specimens. Since the heat affected zone was narrow and the specimens irregular, the specimens could not be relocated with sufficient accuracy to make any estimate of the change of austenite concentration with time. Some austenite was observed, however, as long as 24 hr. after welding.

In somewhat larger water-quenched specimens, no austenite could be found if the austenitizing time was at all prolonged. When the austenitizing time was reduced to a few seconds, an appreciable amount of austenite was retained following quenching.

From the information developed in this investigation, it appears that in

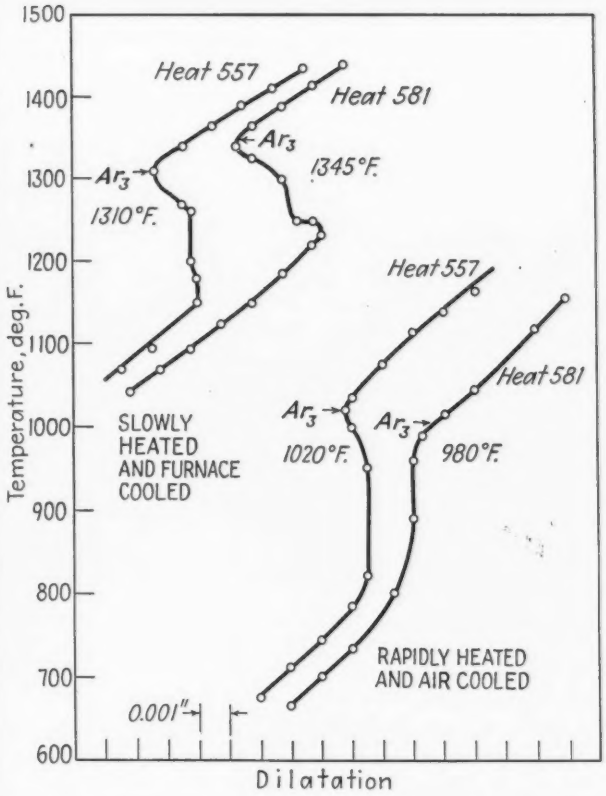


FIG. 5—Dilatometer cooling curves for steels Nos. 557 (insensitive) and 581 (sensitive) (SAE 4130). These curves show how the relative position of the Ar_3 temperatures of the two have been reversed by rapid heating and cooling as compared with the values obtained by the normal procedure of slow heating and cooling.

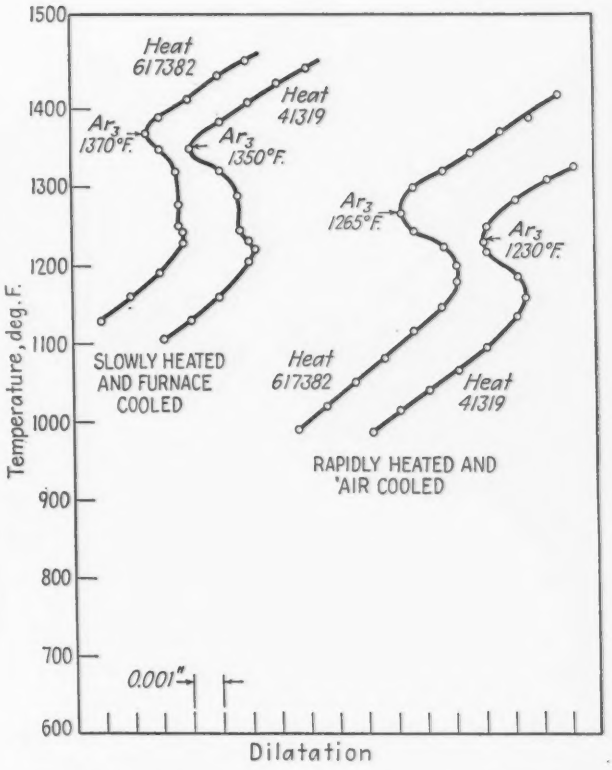


FIG. 6—Dilatometer cooling curves for steels Nos. 617382 and 41319. In both the slow and rapid heating cycles, the crack-sensitive steel No. 41319 displayed the lower Ar_3 temperature.

addition to sufficient hardening elements and restraint, cracking can take place only if the carbides are sufficiently small and properly distributed to promote the retention of austenite in the heat-affected zone, which transforms in a retarded manner after reaching the vicinity of room temperature.

The influence of hydrogen upon underbead cracking has been pointed out by investigators at Watertown Arsenal,* and it has been suggested by Dr. H. H. Lester that the decrease in solubility accompanying the austenite-martensite transformation may force the hydrogen out of solution. This explanation appears entirely feasible.

In view of the present knowledge, it appears that in order for cracks to develop, the following conditions must exist: Sufficient hardening elements, and appropriate carbide size and distribution for the retention of austenite which slowly transforms at about room temperature. Cracking will occur under these conditions, provided the heat-affected zone has absorbed enough hydrogen from the arc or weld metal and cooling has established the needed internal stresses. While little is known about the quantitative relationship of these various factors, it seems that all of these effects are present in crack-sensitive material.

The results of check analyses for the elements commonly determined, together with nitrogen and aluminum contents, are shown in Table IV. The values of the six elements normally reported, and the nitrogen contents offer no explanation for the difference in sensitivity. However, it is of interest to note that the insensitive steel No. 557 has an appreciably higher aluminum content than the sensitive companion steel No. 581. The same situation, but to a greater degree, exists for steels Nos. 51273 and 70304. In the case of the other pair, steels Nos. 617382 and 41319, there is little difference, the aluminum content of the insensitive steel being slightly lower.

* *S. A. Herres, Welding Journal*, 1944, *Vol.* 9, 43; *Trans. Amer. Soc. Metals*, 1944, *Vol.* 33, 535.

TABLE I

Information Concerning the Three Pairs of Commercial SAE 4130 Steels Investigated

Steel No.	Relative Crack Sensitivity	Gage	Ladle Analysis						
			C	Mn	P	S	Si	Cr	Mo
557*	Insensitive**	0.125	0.33	0.54	0.020	0.026	0.17	0.95	0.19
581	Sensitive**	0.125	0.31	0.47	0.023	0.017	0.25	0.94	0.21
617382	Insensitive‡	0.065	0.285	0.50	0.019	0.014	0.21	0.92	0.23
41319	Sensitive‡	0.065	0.295	0.46	0.016	0.018	0.21	0.92	0.23
51273	Insensitive‡	0.035	0.295	0.49	0.015	0.019	0.27	0.96	0.23
70304	Sensitive‡	0.035	0.31	0.54	0.018	0.017	.....	0.93	0.21

* Values obtained by check analysis. ** From weld tests at Battelle Memorial Institute. ‡ So designated by the supplier of the material.

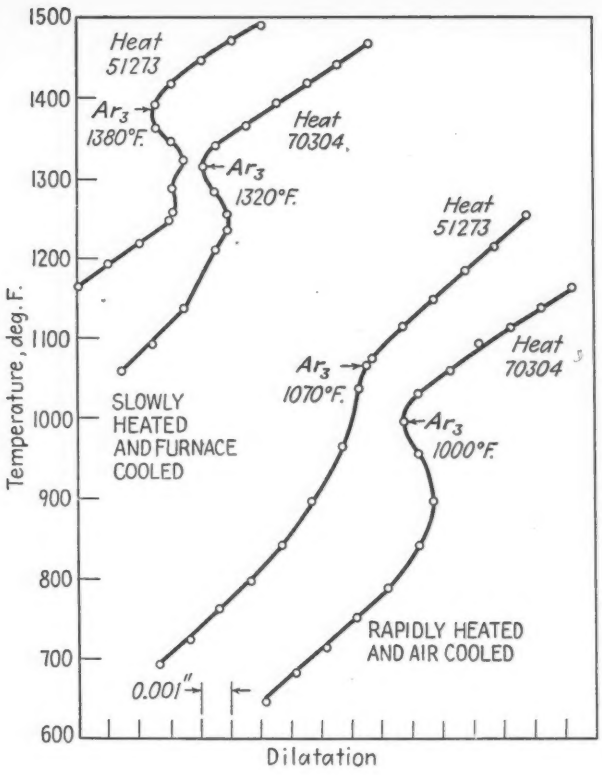


FIG. 7 — Dilatometer cooling curves for steels Nos. 51273 and 70304. These curves are in agreement with the data in the two preceding figures, that is, the Ar_3 temperature of the crack-sensitive steel No. 70304 is lower than the corresponding temperature for the companion steel when rapidly heated and cooled.

A spectrographic compositional difference study also was made which showed the presence of nickel, tin, copper and vanadium, but there was no correlation between the quantity of these elements present and the crack sensitivity. A gas analysis determined by the fractional vacuum fusion procedure also failed to show a relationship with the sensitivity characteristics of these alloy steels.

From the tensile properties listed in Table V, it will be observed that the yield and tensile strength of the sensitive steel No. 581 is appreciably higher than those of the less sensitive companion heat. The same is also true of steels Nos. 617382 and 41319. However, in the case of the third pair, steels Nos. 51273 and 70304, there is little if any difference in the tensile properties.

Hardenability Characteristics

Since hardening characteristics are usually assumed to be associated with cracking, a study was made of the relative hardenability of these steels. Test bars for end-quench hardenability determinations were made by placing 1 x 3½ in. specimens of the sheet material between two ½ in. thick blocks of similar length and width, made from SAE 4330 steel. The two blocks with the specimen between them were then welded along the longitudinal joints and turned to the dimensions of the standard Jominy bar. The bars were held at 1580 deg. F. for 1 hr. followed by quenching in a Jominy jig. Vickers' hardness determinations obtained from these bars are shown in the curves in Fig. 4. The data plotted reveal that two steels of widely different crack-sensitivity characteristics may display similar hardening properties; such as steels Nos. 557 and 581, also the second pair Nos. 617382 and 41319. In the third pair, the crack-sensitive steel No. 70304 developed a higher hardness and was somewhat deeper hardening than the companion steel No. 51273. From the chemical analysis, Table IV, however, it would appear that steel No. 51273 should develop the greater hardness.

The grain-growth characteristics of each of the six steels were determined by heating the specimen to 1750 deg. F. for 2 hr. followed by furnace cooling. These specimens were then compared with similar specimens which had been heated to 1550 deg. F. The results were as follows:

Steel No.	Relative Grain Growth
557	No grain growth.
581	100 per cent of specimen area showed marked grain growth.
617382	100 per cent of specimen area showed marked grain growth.
41319	60 per cent of specimen area showed marked grain growth.
51273	40 per cent of specimen area showed grain growth.
70304	100 per cent of specimen area showed grain growth.

Grain growth is consistent with the aluminum content, taking into account that only the steels in each pair are comparable since the various pairs have received different mechanical and thermal treatments while being procesed to the three gages.

However, an examination of the hard zones adjacent to the welds in steels Nos. 557 and 581 failed to reveal any appreciable differences, the extent of coarsening being about the same in each case.

While the comparison of these steels up to this point has not re-

TABLE II

Summary of Crack-Sensitivity Data

Steel No.	Average Total Length of Cracks Per Specimen in Deg.	Average Total Length of Cracks Per Specimen Per Cent*	Crack Sensitivity Index of Steel**
557	133	18.4	1.00
581	391	54.3	0.84

* Based on 720 deg. = 100 per cent. ** See appendix for method of calculating the Sensitivity Index. Steel No. 557 is used as the control steel with an assigned sensitivity index of 1.00.

TABLE III

Procedures for Making Circular Bead Crack-Sensitivity Tests

Gage In.	Specimen Size In.	Electrode Size In.	Amp.	Volts	Welding Time Sec.	Time Delay Between Finish of Weld and Quench Sec.	Jig Temperature, Deg. F.	Temperature of Quench Water, Deg. F.
1/8	2 x 2	5/64	47	18/24	20±½	3	100	32
3/16	2 x 2	3/32	70	18/24	20±½	3	100	32
1/4	2 x 2	1/8	100	18/24	20±½	3	100	32

vealed any one difference that is especially outstanding, the results do suggest that aluminum content might be an influential factor and that there possibly is some correlation between the tensile properties, especially the yield strength and weld-crack sensitivity. However, additional data are needed to arrive at any definite conclusions.

Temperature-Dilation Characteristics

Since metallic arc welding develops extremely rapid heating rates in the metal adjacent to the bead immediately followed by accelerated cooling, it appeared desirable to investigate the relative response of sensitive and insensitive steel to rapid thermal cycles. This phase of the work was carried out by means of temperature-dilation studies using appropriate thermal cycles. The behavior of each of the three pairs of steels listed in Table I were observed when subjected to the following two heating and cooling cycles:

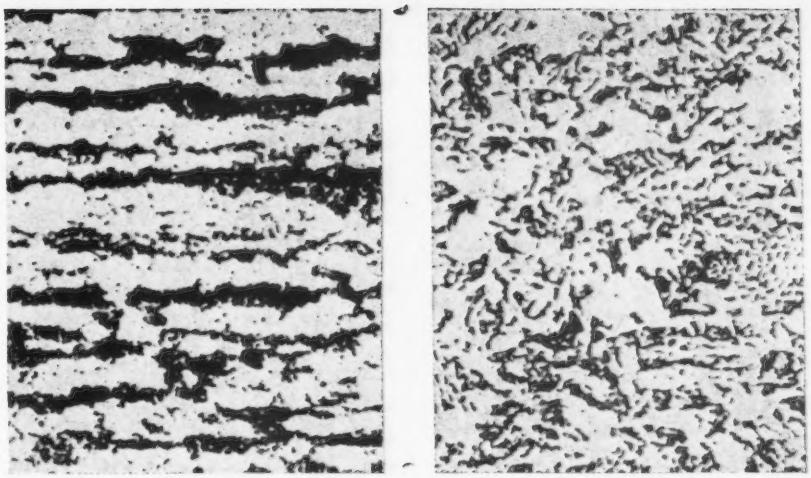
(1) The specimen was *slowly* heated to 1800 deg. F. at an average rate of 41 to 43 deg. F. per min. After holding at 1800 deg. F. for 20 min., the specimen was furnace cooled at an average rate of 17 to 18.5 deg. per min. between 1800 to 700 deg.

(2) The specimen was *rapidly* heated to 1800 deg. at an average rate of 4500 to 500 deg. per min., and upon reaching 1800 deg. was immediately air cooled, the rate ranging from 275 to 425 deg. between the limits of 1800 and 700 deg., the cooling rate being influenced by the gage.

Cylindrical specimens ⅞ in. in diameter and 3 in. long were formed from the 0.035 and 0.065 in. gage material. Specimens from the ⅛ in. stock were made from two 1 x 3 in. strips, each strip having a ⅛ in. slot machined from one end to the center along the longitudinal axis. The two strips were then pressed together forming an X-section 3 in. long. The temperature of both types of specimens was measured by means of a thermocouple spot welded to the specimen.

The cooling portion of each of the cycles outlined above is illustrated graphically in Figs. 5, 6 and 7. The transformation temperatures obtained by means of the slow cycle were not in as good agreement as would be expected, considering the similarity of analysis of these six steels. With the exception of the slightly lower carbon contents of steels Nos. 617382 and 41319, these heats may be considered as essentially identical in analysis. The lack of good agreement is especially noticeable in the Ar_3 temperatures. This inconsistency appears to be due to the heating cycle not being sufficiently slow, or the time held at temperature not being long enough to obtain complete solution of all the carbides. Any variation in the proportion of the carbide dissolved would be reflected as irregularities in the Ar_3 temperatures. Subsequent work supports this conclusion.

Obviously, the temperature dilation curves obtained by the rapid cycle do not indicate the true critical temperatures as the heating time is insufficient for complete solution of the carbides. Although slow compared with heating and cooling rates developed during actual welding, this rapid cycle should indicate any relative dif-



Steel 557—Insensitive *Steel 581—Crack sensitive*

FIG. 8—Microstructures of the two 0.025 in. gage steels showing longitudinal sections at 1000X after a nital etch. These photomicrographs show the carbides are finer and more uniformly distributed in the crack-sensitive steel No. 581 as compared with the insensitive steel.

TABLE IV

Check Analysis of the Commercial SAE 4130 Steels

Steel No.	Crack Sensitivity	C	Mn	P	S	Si	Cr	Mo	N	Al*
557	Insensitive	0.33	0.54	0.020	0.026	0.17	0.95	0.19	0.016	0.027
581	Sensitive	0.34	0.47	0.019	0.021	0.25	0.95	0.19	0.017	0.017
617382	Insensitive	0.30	0.48	0.015	0.014	0.21	0.96	0.20	0.018	0.009
41319	Sensitive	0.30	0.47	0.011	0.022	0.22	0.94	0.20	0.011	0.013
51273	Insensitive	0.35	0.51	0.011	0.020	0.29	1.00	0.19	0.014	0.039
70304	Sensitive	0.34	0.50	0.011	0.014	0.23	0.98	0.20	0.015	0.006

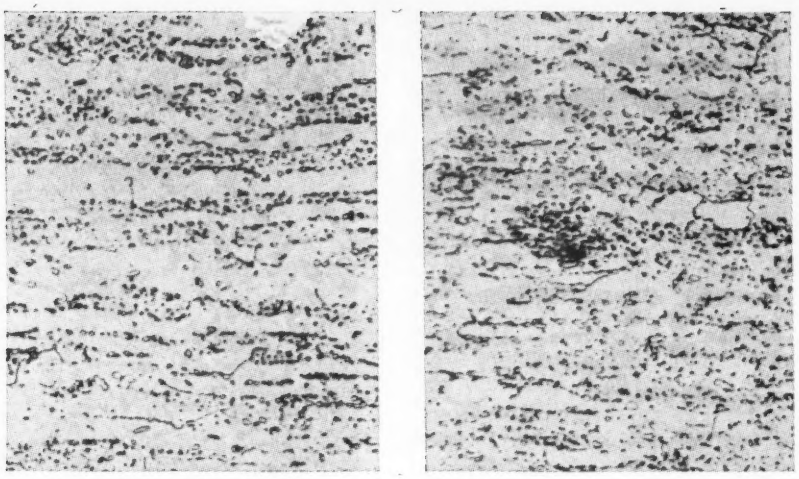
* Acid-soluble aluminum determined.

TABLE V

Tensile Properties of the Commercial SAE 4130 Steels

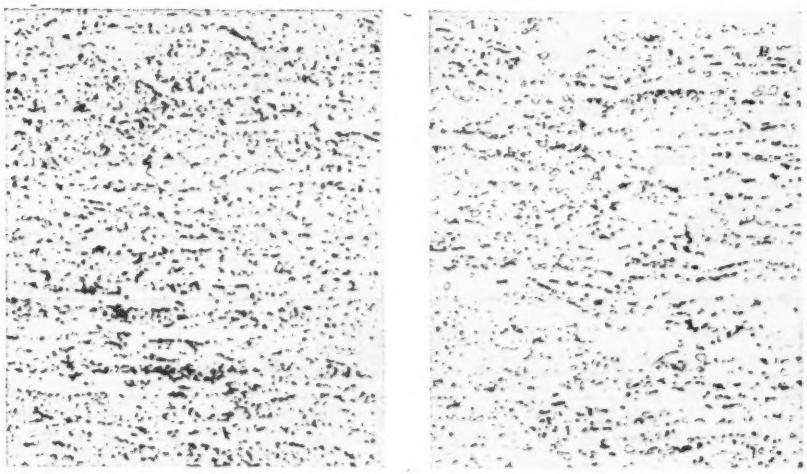
Steel No.	Gage, In.	Yield Strength Lb./Sq. In.	Tensile Strength Lb./Sq. In.	Per Cent Elongation in 2 In.
557	0.125	65,800	94,100	21.0
557	0.125	64,800	93,760	22.0
581	0.125	79,300	99,450	18.5
581	0.125	79,700	101,060	18.0
617382	0.065	53,000	73,110	22.5
617382	0.065	55,500	75,480	22.5
41319	0.065	62,800	81,110	21.0
41319	0.065	66,000	85,160	19.0
51273	0.035	53,100	79,760	24.0
51273	0.035	54,100	80,120	24.5
70304	0.035		77,080	23.0
70304	0.035	53,400	78,780	26.0

Yield strength determined from stress-strain curve using load at 0.2 per cent offset.



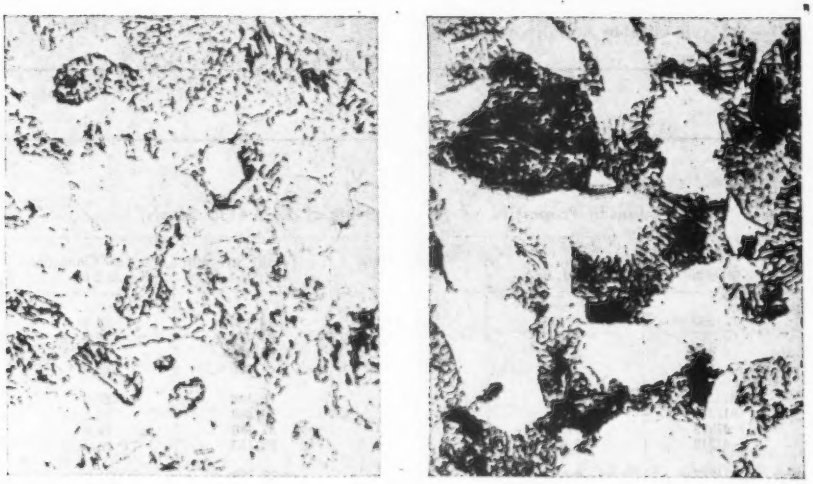
Steel 617382—*Insensitive* *Steel* 41319—*Crack sensitive*

FIG. 9—Microstructures of the 0.065 in. gage steels showing longitudinal sections etched in nital at 1000X. The carbide particles are smaller and better distributed in the crack-sensitive steel No. 41319 than in the companion steel No. 617382.



Steel 51273—*Insensitive* *Steel* 70304—*Crack sensitive*

FIG. 10—Microstructures of the 0.035 in. gage steels showing longitudinal sections etched in nital at 1000X. The structures of these two steels are quite similar with the exception that steel No. 51273 appears to be higher in carbon.



Steel 557—*Insensitive* *Steel* 581—*Sensitive*

FIG. 11—Structures obtained by a spheroidizing treatment obtained by alternately heating to a temperature within and slightly below the critical range. Steel No. 557 is partly spheroidized while No. 581 is lamellar pearlite. Both of these structures were found to have a low degree of crack sensitivity. Nital etch, 1000X.

ference in the response of these steels to the thermal treatment received during welding. As a result of the faster heating, the Ac temperatures in most cases were slightly higher, while the Ar points were appreciably depressed as compared with similar points observed during slower heating and cooling.

The most significant fact uncovered by means of the rapid-thermal cycle is that in each of the three pairs of steels the crack-sensitive steel has a lower apparent Ar_3 temperature than the less sensitive companion fuel. Because the three pairs of steels vary widely in gage and hence have received different mechanical and thermal treatment and because there is a marked difference in microstructure of each of the three pairs, a comparison of all six steels with respect to crack sensitivity and Ar_3 temperature is misleading. The fact that sensitive steel No. 41319, for instance, has a higher Ar_3 temperature than the insensitive steels in the other pairs is without significance.

The lower apparent Ar_3 temperature of the sensitive steels is accounted for by the larger proportion of the carbides which go into solution during the rapid heating cycle, forming a carbon austenite. As the carbon content of the austenite is increased, the higher the hardness will be upon cooling and the more susceptible the structure will be to cracking. The difference in the solubility of the carbides in the sensitive and insensitive steels is presumably due to size and may be influenced in some cases by composition. This opinion is substantiated by the microstructures of the steel under discussion.

Effect of Microstructure

The microstructures of the six steels in the "as-received" condition are shown in Figs. 8, 9 and 10. From Fig. 8, it will be noted there is a marked difference in the structure of the insensitive steel No. 557 as compared with the crack-sensitive steel No. 581, the carbides in the latter being much finer and more uniformly distributed. Both the steels in Fig. 9 are spheroidized but the structure of the crack-sensitive steel No. 41319 consists of small spheroidal carbides fairly uniformly distributed in a matrix of ferrite, while in the less sensitive companion steel, No. 617382, the carbides are larger and less uniformly distributed, leaving relatively large islands of free ferrite.

From these microstructures, it is obvious why the apparent Ar_3 temperatures obtained by rapid heating and cooling of the sensitive steels, Nos.

581 and 41319, are lower than the similar transformation temperatures of the insensitive companion steels. The fine carbides in the sensitive steels go into solution more rapidly, resulting in a higher carbon austenite which lowers the temperature at which the Ar_3 transformation takes place.

The structures of the two 0.035 in. gage steels, shown in Fig. 10, are quite similar with the exception that the less sensitive steel, No. 51273, appears and is higher in carbon. Subsequent work revealed that frequently there is not enough difference in the structures at 1000 or 2000X to differentiate a sensitive from a relatively insensitive steel, although the difference is clearly indicated by the dilatometer characteristics and the results of circular bead tests.

Since structure was found to be an important factor with respect to weld-crack sensitivity, various microstructures were developed in steels Nos. 557 and 581, using the heat treatments listed below, and the crack-sensitivity then measured:

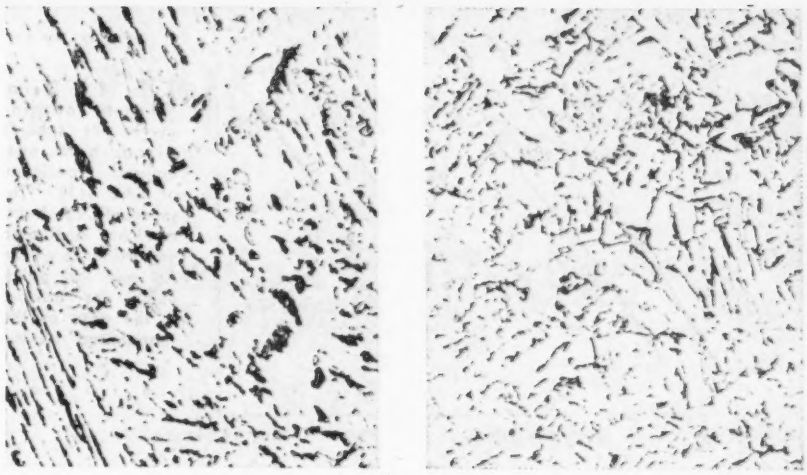
(1) Normalized at 1700 deg. F. for 1 hr. followed by air cooling.
(2) Spheroidized by alternately heating to a temperature within and slightly below critical range.
(3) Spheroidized followed by normalizing at 1900 deg. for 1 hr., then air cooled.
(4) Homogenized for 100 hr. at 1900 deg. followed by normalizing from 1900 deg.

A summary of the crack-sensitivity test data from the four lots of steel treated as outlined above is listed in Table VI. It will be noted that normalizing slightly decreased the sensitivity of both steels as compared with the "as-received" condition (see Table I). The microstructures of these two steels appeared quite similar.

The apparent Ar_3 temperatures obtained from the cooling portions of the dilatometer curves of both normalized steels were slightly higher than similar values for the "as-received" material. These data are in agreement with the decrease in sensitivity indicated by the circular bead sensitivity test.

After spheroidizing, both steels were extremely insensitive, Table VI. It is also significant to note the difference in the structures, Fig. 11, despite identical treatment. This difference in response to the spheroidizing treatment appears to be due to the variation in aluminum content, the high aluminum steel, No. 557, spheroidizing more rapidly (see Table IV).

While the structures were somewhat different in the two spheroidized steels, both reacted similarly to the rapid dilatometer cycle, Fig. 12. It appears that the carbide plates in the pearlitic structure of steel, No. 581, were sufficiently coarse to react during heating in a manner similar to the partly spheroidized steel, No. 557, In both cases, the response is that of a coarse carbide structure, and the temperature-dilation curves, Fig. 12, of the spheroidized steels indicate little or no evidence of the Ar_3 or Ar_1 transformations. It will also be noted in Table VII that the Ac_1 and Ac_3 temperatures of the spheroidized steels are appreciably higher than in the case of the normalized stock. This indicates that the carbon content of the austenite formed from the spheroidized steels was considerably lower than in the normalized steels. As a result of the carbon austenite, together with the chromium content which increases the sluggishness, the transformation does not take place with sufficient rapidity to produce a rate of expansion which is equal to or greater than the contraction resulting from cooling. Therefore, no points of expansion occurred in the



Steel 557 *Steel* 581

FIG. 11A—Structure obtained by spheroidizing followed by normalizing. Nital etch, 1000X.

TABLE VI

The Effect of Thermal Treatment Upon Crack Sensitivity

Steel No.	Thermal Treatment	Crack Sensitivity Index
557	Normalized	1.05
581	Normalized	0.90
557	Spheroidized	1.15
581	Spheroidized	1.17
557	Spheroidized and normalized	1.14
581	Spheroidized and normalized	1.25
557	Homogenized and normalized	0.82
581	Homogenized and normalized	0.89

TABLE VII

Transformation Temperatures

Steel No.	Heat Treatment	Average Heating Rate Between 80-1800 Deg. F. in Deg. per Min.	Average Cooling Rate Between 1800-700 Deg. F. in Deg. per Min.	Transformation Temperatures, Deg. F.			
				Ac_1	Ac_3	Ar_3	Ar_1
557	Normalized	450/500	275/300	1390	1500	1030	820
557	Spheroidized	450/500	275/300	1500	1580	....	....
557	As-received	450/500	275/300	1400	1490	1020	940/830
581	Normalized	450/500	275/300	1390	1490	1025	900
581	Spheroidized	450/500	275/300	1490	1590	....	....
581	As-received	450/500	275/300	1390	1470	980	900/800

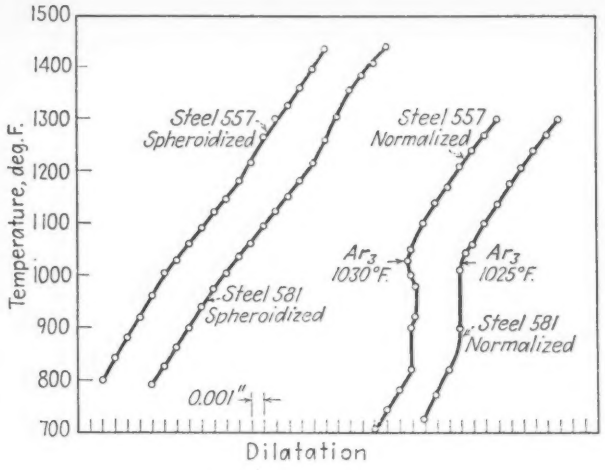


FIG. 12 — Dilatometer cooling curves for spheroidized and normalized specimens of SAE 4130. The spheroidizing treatment has eliminated any evidence of the Ar_3 and Ar_1 points which are obvious in the case of the normalized steels.

cooling curves of the two spheroidized steels.

Hardness Surveys

In order to determine the effect of structure upon the hardness of the heat-affected zone, circular bead specimens were made on both the normalized and spheroidized material from steels Nos. 557 and 581. Using the specimen in the "as-welded" condition, the bead was ground flush with the surface, and hardness surveys were made on the surface across the heat-affected and fused zones at a point 180 deg. from the start of the bead. The results of the hardness surveys are shown graphically in Fig. 13. For each steel, the highest hardness was developed in the normalized specimens, because the more readily soluble carbides of the normalized specimens produced a higher carbon austenite during the short interval the steel was above the critical temperature. Upon cooling, this austenite developed a greater hardness than was found in the similar zone of the spheroidized specimen. A study of the microstructure of the hard areas in the heat-affected zone substantiated these views. It was found that in the hard zone of the spheroidized steel there were relatively large undissolved carbides which contribute little to the hardness of the structure. On the other hand, no large carbides could be found in the hard zone of the normalized steels.

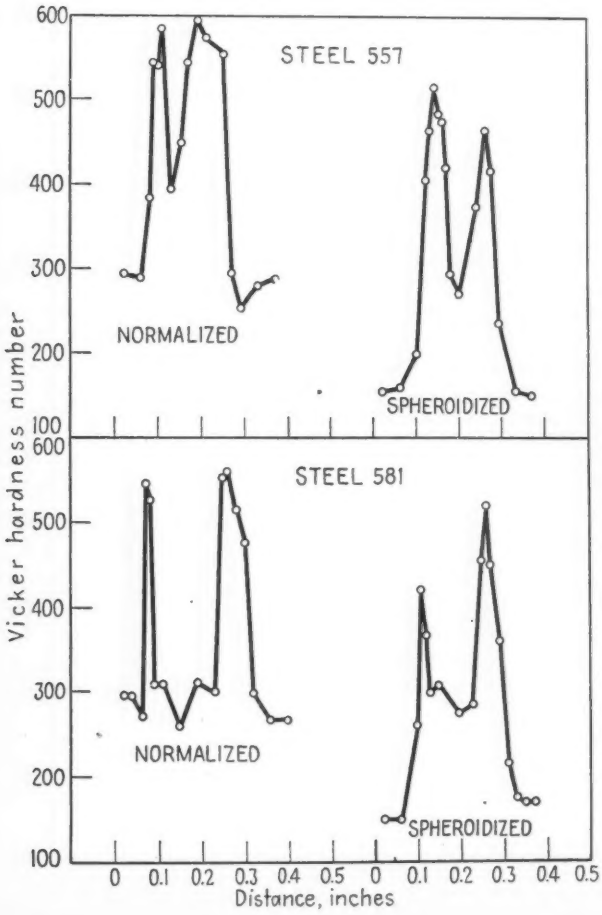


FIG. 13 — Hardness surveys across the heat-affected and welded zones of circular bead test specimens. The hardness values were determined after the bead was ground flush with the plate, the specimen polished and etched in nital. Each survey was made at a point 180 deg. from the start of the weld.

Following the spheroidizing treatment described above, specimens from both heats were normalized by heating to 1900 deg. F. for 1 hr. in a non-oxidizing atmosphere followed by air cooling. The high temperature and long cycle were selected with the object of obliterating the effect of the previous thermal treatment. The results of the crack-sensitivity tests (see Table VI) reveal that the drastic normalizing did not destroy the extremely insensitive properties which were developed by the spheroidizing treatment. These data indicate that in the case of SAE 4130, which reacts sluggishly to thermal treatment owing to the stability of the chromium and molybdenum carbides, the thermal history prior to the final normalizing treatment exerts an appreciable influence upon the crack sensitivity.

The fourth treatment, consisting of homogenizing at 1900 deg. F. for 100 hr. followed by normalizing at 1900 deg. for 1 hr., produced a high degree of weld-crack-sensitivity in both steels, again illustrating that the crack-sensitivity characteristics are strongly influenced by the thermal treatment prior to the final normalizing. In this case, the homogenizing treatment practically insured complete solution of the carbides resulting in a fine uniformly dispersed carbide structure which contributes to a high degree of sensitivity.

The information obtained from this study concerning the effect of structure clearly indicates that the sensitivity of a given steel may be varied over a wide range, depending upon the thermal treatment. And it was also found that the structure and thermal history, prior to the final normalizing, exert a strong influence upon the sensitivity since normalizing does not destroy the effect of the previous structure.

INDIUM PLATING

With Cyanide Caustic Bath

. . . Use of potassium hydroxide in conjunction with potassium cyanide overcomes the difficulties normally encountered in bath preparation, halts bath decomposition and eliminates the necessity of aging the plating electrolyte before use.

o o o

By J. B. MOHLER
Research Chemist, Cleveland

o o o

WHILE the present day importance of indium is due to a great extent to the role it plays in aircraft engine bearings, the cost of the metal, which is roughly in a class with gold, is the factor which may discourage experimentation for new uses. There is enough indium available in the crude form, however, that the price may be expected to drop with the use of larger quantities.

Experimentation for surface treatment will be encouraged by the improvement of existing plating baths. It has been observed recently that lead plating was more rapidly accepted as a substitute for tin due to the availability of lead fluoborate concentrate in place of the component chemicals that were difficult to convert to a plating bath. If lead fluoborate solution had been available 25 years ago, it is probable that lead plating would not have been dropped so readily following World War I.

There is no such thing as a perfect plating bath but there are many practical, easy to control baths in the two general classes—acid and alkaline. (Some plating baths of pH close to 7.0 may be regarded as neutral.)

In general, acid baths are characterized by high cathode efficiency and good anode corrosion whereas the alkaline baths have good throwing power and inherent cleaning ability allowing a greater margin of safety in the preparation of the work to be plated.

The competing acid and alkaline indium baths have been described by M. C. Whitehead in *Metal Finishing* (July, 1944, p. 405) and some of the disadvantages of the cyanide bath described by J. R. Dyer, Jr., in the Dec. 19, 1940, issue of THE IRON AGE were pointed out.

The disadvantages of the cyanide indium bath are:

1. Difficulty of preparation
2. Bath decomposition
3. Necessity of aging before use
4. Insoluble anodes.

The first three disadvantages can be overcome by the use of caustic in the bath. This bath has not been extensively used but enough work has been done to recommend limits and to warrant further work to test the limits and possibly to overcome the remaining objection to the bath.

The recommended limits are:

Indium	15-30 gm. per liter
Potassium cyanide	140-160 gm. per liter
Potassium hydroxide	30-40 gm. per liter
Dextrose	20-30 gm. per liter
Current density	15-30 amp./sq. ft.
Temperature	Room
Anodes	Steel

The bath is prepared by simply dumping a concentrated solution of indium and dextrose into a concentrated solution of cyanide and caustic, followed by dilution. It is well to try this on a small scale first to see just how it is done as there is some danger that if the solutions are mixed slowly a precipitate will form that will not redissolve. The total mixing time should be of the order of a few seconds.

The cyanide and indium are controlled by the usual analytical procedures and the caustic by titration using LaMotte sulfo-orange indicator, although a better method of caustic control may be in order.

The bath gives a good white deposit immediately, and will continue to do so to a very low indium concentration so that indium can be removed from the bath almost completely by simply plating. The bath maintains satisfactory cathode efficiencies and does not attack ferrous anodes to the extent of the cyanide bath. Bath stability is very good and only traces of precipitate were obtained in a 10 liter laboratory bath used intermittently over a period of one year.

In some respects this bath has the characteristics of tin. One of these is the characteristic polarized films formed on the anode except that in the case of indium these are only slowly soluble. With increased bath stability some experiments at elevated temperatures and with additives similar to sodium acetate in the tin bath are in order to develop a soluble anode and overcome the remaining objection to this bath.

. . . Measuring Efficiency of

o o o

TRAINING new personnel in arc welding is an important and a vital part of the production of all welded ships. At Calship, training for welding work is a production job no different from that of any other production process. That is, you start out with raw material, process it, inspect and turn out the product.

This production process is necessarily large scale in scope in order to handle the personnel requirements of the yard. Naturally in any large scale production process, the system of processing the raw material is governed by the following factors (all related to the economics of time, finances, etc.):

1. Quality of raw material as received
2. Use of the processed product
   (a) Consumption
   (b) Inspection standards
3. Time for processing
4. Equipment, materials, personnel, etc., used to convert raw material to end product.

In large scale production it is necessary to decide upon the method of process, with all details worked out, in order to obtain maximum production capacity. In the training of welders the method of processing is dependent upon the following factors:

1. Minimum production requirements for student welders after leaving "formal" training
2. Money allocated to formal training of operators
3. Operator qualification requirements.

The *ideal* method of processing is that one which, in minimum time, would turn out mechanics who would be able to do normal production work without further training. Practically this objective is never reached, since time and money force a compromise. The purpose of this report is not to present the method of training or the qualifications of personnel so trained, but rather to present a system of measurement of efficiency and production control of the training process regardless of method or end point.

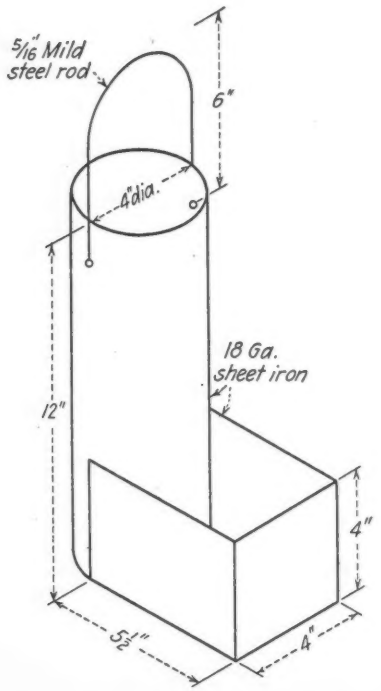
Yardstick Needed

In order to know if a process is working efficiently and in order to know the status of each unit in a production flow line, it is necessary to have a method of quantity and quality control as well as a method of determining quickly and with a minimum of effort the operating efficiency of personnel and equipment used in the work. All such controls are in turn used to improve quantity, quality and efficiency.

Presented below is the method of such controls, the use of the method and the results obtained by its use.

A person learns to arc weld by translation of a visual action into a manual action, that is, by manual manipulation certain results are obtained which can be seen. There are probably in all cases several manual manipulations which might be used to give identical visual results. Therefore the time used in actual burning of electrodes and intelligent instruction is a possible basis of measurement of production quantity, quality and efficiency.

At Calship a system of measuring "arc time" by use of consumed electrode count has been devised. This could have been done by use of arc time meters; however, by the simple use of an electrode count the problem of housekeeping was licked, full consumption of electrodes and full use of available manhours in the rod distribution department were attained, and incidentally the added equipment expense (installation and maintenance of arc time meters) was eliminated.



LEFT

FIG. 1 — Electrode distribution can provides container for stubs.

o o o

RIGHT

FIG. 2—Rod issue, stub count and arc time recorded on this form. A card is filled out for each student.

ROD CAN NO._____ BADGE NO._____ NAME_____ SHIFT____

DATE	ISSUED RODS	RETURNED STUBS	ARC TIME	DATE	ISSUED RODS	RETURNED STUBS	ARC TIME

Training Welders . . .

o o o

By. J. B. ARTHUR
Testing Engineer
and
M. H. MacKUSICK
Welding Engineer
California Shipbuildingg Corp., Wilmington, Cal.

o o o

. . . After establishing standard burn-off rates for various size arc welding electrodes, use of a consumed electrode count (stubs) gives a simple gage of arc time from which a comparative measure of efficiency can be readily calculated for individual students, teacher effectiveness and length of training time vs. tests passed. An increase of 30 per cent in training effectiveness was achieved in two months in this shipyard by the use of the system described.

Electrode distribution cans were made up as shown in Fig. 1. These cans are all numbered and each student is assigned a specific can. Cans are also colored according to a shift code, thus facilitating the work of electrode distribution clerks in issuing electrodes to students.

Initially each student is issued 100 electrodes. Stubs are deposited into the can and the can is then returned to the rod room at the end of the shift or sooner if necessary. Stubs are counted and the count is entered on the form shown in Fig. 2.

The arc time is calculated from the following equation:

Arc time, min. = No. of stubs x standard burn-off rate.

Burn-off rate is expressed in minutes required to burn 12 in. off of a 14-in. electrode.

Extensive checks were made and the figures shown below are average and accurate for machine settings used in training. These rates are for AWS Class E6010 electrodes, with 2-in. stub loss:

Size of Electrode In.	Burn-Off Rate Time, Sec.	In./Min.
1/8	69	10½
5/32	80	9
3/16	84	8½

As an example, if 50 3/16-in. stubs (2 in. average length) were returned,

$$\text{Arc time} = 50 \times \frac{84}{60} = 70 \text{ min.}$$

This arc time is transferred to the card shown in Fig. 3. The card shown above is filled out further from time cards and test records. Calculations for efficiency are made as follows:

$$\text{Efficiency, per cent} = \frac{\text{Arc time, min.}}{\text{Training time, min.}} \times 100$$

Thus, assuming a 9-hr. shift and full training with 50 3/16-in stubs returned, the per cent efficiency would be as follows:

$$\text{Efficiency} = \frac{50 \times \frac{84}{60}}{9 \times 60} = 13 \text{ per cent (app.)}$$

All cards are kept up daily by one clerk for all shifts and all students. From this card monthly averages are established to give the following figures for comparison of instructors, shifts and students, and also to gage improvement or make changes in the training process:

1. Average percentage operating efficiency
   (a) by instructors
   (b) by shift
   (c) over all
2. Average arc hours required to pass qualification tests
3. Training time vs. arc hours vs. tests passed.

All students are compared daily with the standards set up as above. Any variations from the standards are analyzed and if below average, the student is checked by the superintendent and the instructor. The following possible check list of variations and possible causes is then used to determine what is happening:

Condition 1. High operating efficiency, average training time, but repeated failure of weld tests.
ANALYSIS: 1. Poor instruction
2. Insufficient instruction
3. Repetition of an error in manipulation which has not been corrected
4. Nervous student
5. Incompetent student

Condition 2. Low operating efficiency and repeated failure of weld tests.
ANALYSIS: 1. Lazy Student or low in intelligence
2. Physical handicap of student
3. Lazy or incompetent instructor.

Condition 3. Average operating efficiency. but repeated failure of weld tests.
ANALYSIS: 1. Lazy or incompetent instructor

(CONCLUDED ON PAGE 110)

FIG. 3—Calculations of efficiency are made from the data recorded on this form, one for each student.

NAME:_____ STARTING DATE:_____
BADGE NO._____
INSTRUCTION:_____

ARC HOURS				TRAINING TIME				PER CENT EFFICIENCY				TESTS AND RESULTS			
DATE	HRS.	DATE	HRS.	DATE	HRS.	DATE	HRS.	DATE	%	DATE	%	DATE	RESULT	DATE	RESULT

Time Allowances

For Multiple Spindle Drilling

OPERATION standards for multiple drilling have been evolved by the Corwith plant of the Crane Co., Chicago, in order to assure fixed cost factors, to give productive supervision a method of control in maintaining uniform operating and machining conditions, and to facilitate arrival at proper time allowances in establishing uniform piece work rates. Even though the aims of other plants may not be identical, such standards should be valuable in deriving labor costs, maintaining machining schedules and systematizing operations.

The basic time study undertaken by the Crane Co. standards department covered a wide range of multiple drilling operations, which are unusually numerous in valve and fitting manufacture. Operations of over 200 machines of widely varying age, make, condition and capacity had to be correlated statistically in order to establish a common plane, and allow evaluation of good machining practice and proper utilization of tooling. Standards evolved, which cover operations with machine ground 18-4-1 high steel twist drills, apply to regular model drill presses. These machines, varying in size, are capable of drilling bolt circles with diameters from 8 in. on the smaller machines to 43 in. on the larger machines. The number of drill spindles varies from 8 to 36. Electric motive power furnished with or to the machines ranges from 10 to 40 hp.

The standards presented in the tables assist in selection of equipment to perform operations on an efficient basis as well as breaking down the actual drilling operations and related accessory operations into their component time factors. Machine selection can be made by consulting Tables I to IV which indicate the amount of energy required for drilling cast brass, cast steel, cast iron and forged steel with various size drills at standard feeds and speeds. Obviously, the machine chosen for an operation must have available the necessary power for the particular operation plus energy necessary to overcome normal friction losses of the machine itself. For example, in considering a multiple drilling operation requiring 10 standard 1½-in. holes to be drilled through cast brass, consultation of Table I shows that 4.12 hp. are required per drill, or a total of 41.2 hp. for 10 drills. If the machine under consideration does not have this available power plus that necessary for idle operation, it obviously cannot capably perform the drilling operation.

Power requirements were determined by correlating data from a number of sources with actual watthour readings made by the Crane electrical department over a period of six months. Outside sources included data supplied by the National Twist Drill Co., National Automatic Tool Co., Moline Tool Co., Baush Machine Co. and American Machinists' Handbook. Most published data gives the power requirements in increments of ⅛-in. drill sizes and the data for the in-between sixteenths had to be interpolated.

The component time factors for a complete operation include, in addition to actual drilling time, time for entry of drills into the work and overtravel, product handling before and after the operation, machine care and tool care.

In determining total distance of tool travel, consideration must be given to (1) length of travel neces-

TABLE I

Minimum Standards for Multiple Drilling Solid Cast Brass H. S. Steel Drills (Machine Ground)

Drill Size, In.	Decimal Range, In.	Horse Power Per Drill	Tool Care Per Cent (a)	Speed R.P.M.	Feed In./Rev.	Speed R.P.M.	Feed In./Rev.	Speed R.P.M.	Feed In./Rev.	Speed R.P.M.	Feed In./Rev.	Speed R.P.M.	Feed In./Rev.
⅛	0.0 –0.125	0.14	2.4	2500	0.0015	2000	0.002	1300	0.003	1000	0.004	800	0.005
¼	0.126–0.250	0.22	2.8	2000	0.002	1300	0.003	1000	0.004	800	0.005	670	0.006
⅜	0.250–0.375	0.40	3.3	1300	0.003	1000	0.004	800	0.005	670	0.006	570	0.007
½	0.376–0.500	0.63	3.7	1000	0.004	800	0.005	670	0.006	570	0.007	500	0.008
⅝	0.501–0.625	0.88	4.2	800	0.005	670	0.006	570	0.007	500	0.008	440	0.009
¾	0.626–0.750	1.20	4.8	670	0.006	570	0.007	500	0.008	440	0.009	400	0.010
⅞	0.751–0.875	1.50	5.6	570	0.007	500	0.008	440	0.009	400	0.010	360	0.011
1	0.876–1.000	1.92	6.3	500	0.008	440	0.009	400	0.010	360	0.011	330	0.012
1⅛	1.001–1.125	2.40	7.2	440	0.009	400	0.010	360	0.011	330	0.012	300	0.013
1¼	1.126–1.250	2.92	8.0	400	0.010	360	0.011	330	0.012	300	0.013	270	0.014
1⅜	1.251–1.375	3.49	8.8	360	0.011	330	0.012	300	0.013	270	0.014	230	0.015
1½	1.376–1.500	4.12	9.6	300	0.012	260	0.013	230	0.014	210	0.015	190	0.016
1¾	1.501–1.750	5.50	10.5	250	0.013	230	0.014	210	0.015	190	0.016	170	0.017

(a) Allowance for tool care shall be percentage shown per drill. Based on actual drilling time, using the nearest combination of above, available on machine. (b) Machine care by operator 4.0 per cent. Average 200 in. per drill per grind. The above table is based on approximately 4 in. travel and 100 ft. peripheral speed per min.

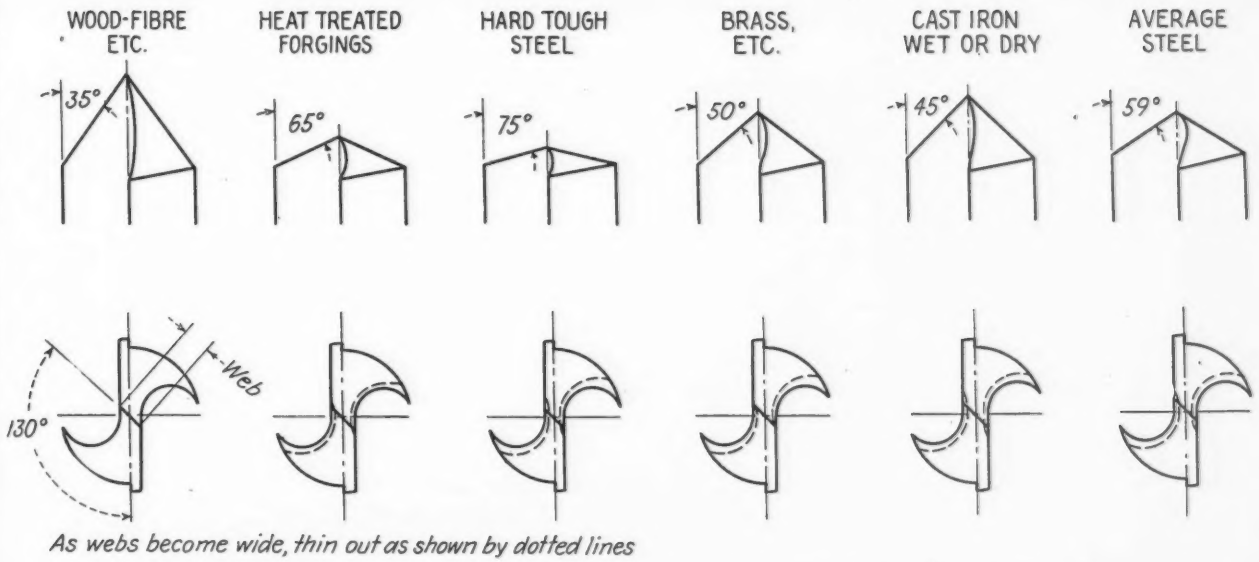


FIG. 1—National Twist Drill Co. drill point grinding recommendations for use with various materials.

sary for the point of the twist drill to enter the material; (2) total average thickness of material to be drilled, taking into account maximum limits specified on the product drawing or permitted by the inspection department; (3) average amount of drill overtravel after breaking through the material, plus an allowance of approximately 1/16 in. to cover possible thickness variations.

Allowance for entry and overtravel is dependent on the angle at which drills must be ground for best results (see Fig. 1). It is pointed out that drills not machine ground according to this standard practice will produce abnormal strain on machinery and equipment and cause heavy burrs and ridges in the drilled holes. This is particularly true in the more ductile or malleable metals. Use of damaged drills likewise may cause a sharp rise in power consumption resulting in undue strain to the motor and the machine. Standard allowances for entry and overtravel thus may be computed from the following standard allowances:

Material To Be Drilled	Drill Point Angle, Deg.	Overtravel and Drill Point Allowance Per Cent of Drill Diameter
Forged steel	65	30
Cast steel	59	37
Cast and forged brass	50	49
Cast iron	45	57

Conversion of the percentages from this table into definite lengths added to the average thickness of the material drilled equals the maximum distance of drill travel necessary to perform the complete drilling operation.

The thickness of the material (plus allowance for entry and overtravel) provides the key to calculation of an accurate total time value for the complete drilling cycle. The revolutions per minute and feed per revolution at which the machine will operate is indicated by comparison with the table covering the material being drilled (see Tables I-IV). With these data, a simple calculation gives an accurate total time value for the actual drilling cycle.

Handling Time Allowances

No handling time allowance is made for any operations which can be performed by the operator during drilling time. Otherwise handling time allowance is broken down into the following elements:

(*1*) *Pick up time:* Operator moves to work, picks up piece, transports it to machine work place and properly places it at the work piece. If this operation is performed by hand, 0.05 min. is allowed for pieces weighing 15

TABLE II

Minimum Standards for Multiple Drilling Solid Mild Cast Steel
H. S. Steel Drills (Machine Ground)

Drill Size, In.	Decimal Range, In.	Horse Power Per Drill	Tool Care Per Cent (a)	Speed R.P.M.	Feed In./Rev.	Speed R.P.M.	Feed In./Rev.	Speed R.P.M.	Feed In./Rev.	Speed R.P.M.	Feed In./Rev.	Speed R.P.M.	Feed In./Rev.
1/8	0.0 -0.125	0.180	1.4	1200	0.002	800	0.003	600	0.004	480	0.005	400	0.006
1/4	0.126-0.250	0.280	1.6	800	0.003	600	0.004	480	0.005	400	0.006	340	0.007
3/8	0.251-0.375	0.500	1.9	600	0.004	480	0.005	400	0.006	300	0.008	240	0.010
1/2	0.376-0.500	0.750	2.2	480	0.005	400	0.006	300	0.008	240	0.010	200	0.012
5/8	0.501-0.625	1.000	2.5	400	0.006	340	0.007	300	0.008	240	0.010	200	0.012
3/4	0.626-0.750	1.390	2.8	340	0.007	300	0.008	240	0.010	200	0.012	170	0.014
7/8	0.751-0.875	1.920	3.2	300	0.008	270	0.009	220	0.011	190	0.012	160	0.015
1	0.876-1.000	2.500	3.6	270	0.009	240	0.010	200	0.012	170	0.014	150	0.016
1 1/8	1.001-1.125	3.200	4.0	240	0.010	200	0.012	170	0.014	150	0.016	130	0.018
1 1/4	1.126-1.250	3.950	4.4	200	0.012	170	0.014	150	0.016	130	0.018	120	0.020
1 3/8	1.251-1.375	4.750	4.8	180	0.012	150	0.014	130	0.016	120	0.018	110	0.020
1 1/2	1.376-1.500	5.700	5.2	160	0.012	140	0.014	120	0.016	110	0.018	100	0.020
1 3/4	1.501-1.750	7.650	5.6	140	0.012	120	0.014	110	0.016	100	0.018	90	0.020

(a) Allowance for tool care shall be percentage shown per drill. Based on actual drilling time, using the nearest combination of above, available on machine. (b) Machine care by operator 4.0 per cent. Average 210 in. per drill per grind. The above table is based on approximately 2.4 in. travel and 50 ft. peripheral speed per min.

TABLE III

Minimum Standards for Multiple Drilling Cast Iron
H. S. Steel Drills (Machine Ground)

Drill Size, In.	Decimal Range, In.	Horse Power Per Drill	Tool Care Per Cent (a)	Speed R.P.M.	Feed In./Rev.	Speed R.P.M.	Feed In./Rev.	Speed R.P.M.	Feed In./Rev.	Speed R.P.M.	Feed In./Rev.	Speed R.P.M.	Feed In./Rev.
1/8	0.0 –0.125	0.100	0.8	1500	0.002	1000	0.003	750	0.004	600	0.005	500	0.006
1/4	0.126–0.250	0.160	1.0	1000	0.003	750	0.004	600	0.005	500	0.006	400	0.008
3/8	0.251–0.375	0.280	1.2	750	0.004	600	0.005	500	0.006	400	0.008	300	0.010
1/2	0.376–0.500	0.430	1.3	600	0.005	500	0.006	400	0.008	300	0.010	250	0.012
5/8	0.501–0.625	0.610	1.5	500	0.006	400	0.008	320	0.010	260	0.012	225	0.014
3/4	0.626–0.750	0.810	1.8	400	0.008	320	0.010	275	0.012	240	0.013	220	0.014
7/8	0.751–0.875	1.000	2.0	350	0.009	290	0.010	275	0.012	240	0.013	200	0.015
1	0.876–1.000	1.300	2.3	300	0.010	275	0.011	250	0.012	225	0.014	200	0.015
1 1/8	1.001–1.125	1.660	2.6	275	0.011	250	0.012	225	0.014	200	0.015	175	0.017
1 1/4	1.126–1.250	2.050	2.9	250	0.012	225	0.013	200	0.015	175	0.017	150	0.020
1 3/8	1.251–1.375	2.470	3.2	225	0.013	200	0.014	175	0.016	150	0.018	130	0.020
1 1/2	1.376–1.500	2.950	3.5	200	0.014	175	0.014	150	0.016	130	0.018	115	0.020
1 3/4	1.501–1.750	4.000	3.8	175	0.014	150	0.014	130	0.016	110	0.018	100	0.020

(a) Allowance for tool care shall be percentage shown per drill. Based on actual drilling time, using the nearest combination of above, available on machine. (b) Machine care by operator 4.0 per cent. Average 415 in. per drill per grind. The above table is based on approximately 3 in. travel and 55 ft. peripheral speed per min.

lb. or less; 0.07 min. for those weighing 15 to 35 lb. If the product normally is handled with air cylinder or motor, electric or chain hoist, the time values allow for operator moving to product, lowering or raising hoist so as to properly grasp the product, raising the product to proper height, returning to work place and properly placing the piece there, releasing the hoist and placing it aside. Time allowances are those shown in Table V.

(*2*) *Position jig:* Time allowance is for picking up jig, positioning it over the part and clamping it. No time is allowed for this element when two jigs are available and the work can be accomplished during drilling time. Otherwise, time allowances are those shown in Table VI.

(*3*) *Position work piece:* Time allowance is for moving piece under spindles and lining up properly with drill. When the work is positioned on rails, 0.03 min. is allowed for pieces weighing 15 lb. or less; 0.04 min. for pieces weighing 16 to 35 lb.; and 0.06 min. for pieces weighing over 35 lb. For work positioned on tables, 0.03 min. is allowed for pieces weighing 15 lb. or less; 0.06 min. for pieces weighing 16 to 35 lb.; and 0.13 min. for pieces weighing over 35 lb. For work positioned on fixtures, 0.05 min. is allowed for pieces weighing 15 lb. or less; 0.07 min. for pieces weighing 16 to 35 lb.; and 0.12 min. for pieces weighing over 35 lb.

(*4*) Start of drilling: Allowance is for operator lowering spindles or raising table to bring drills into contact with work, and starting machine feed. If six spindles or less are operative, 0.03 min. is allowed; from 7 to 12 spindles, 0.05 min.; 13 to 36 spindles, 0.10 min.; and for hydraulic feed, 0.02 min.

(*Drilling time:* Computed from Tables I to IV.)

(*5*) Withdraw drills: Allowance is for raising spindles or lowering table in order to clear jig and projections on work piece. If six spindles or less are operated, 0.03 min. are allowed; 7 to 12 spindles, 0.04 min.; 13 to 36 spindles, 0.08 min., and for hydraulic feed, 0.02 min.

(*6*) *Remove piece:* Allowance is for sliding piece out from under spindles. If piece can be pushed back or to one side with the next piece no time is allowed. Otherwise, 0.03 min. is allowed for pieces weighing 15 lb. or less; 0.04 min. for pieces from 16 to 36 lb.; and 0.10 min. for pieces over 36 lb.

(*7*) *Remove jig:* Allowance is for loosening and removing clamps, removing jig from piece and placing to side. Again, wherever possible, clamps should be removed during drilling time. If two jigs are available, no time is allowed provided the drilling element is of sufficient duration to allow the work to be done during drilling time. Otherwise allowance is made according to Table VII.

(*8*) *Place away piece:* Allowance is for operator taking piece from work place, placing it in a suitable

TABLE IV

Minimum Standards for Multiple Drilling Solid Forged Steel
H. S. Steel Drills (Machine Ground)

Drill Size, In.	Decimal Range, In.	Horse Power Per Drill	Tool Care Per Cent (a)	Speed R.P.M.	Feed In./Rev.	Speed R.P.M.	Feed In./Rev.	Speed R.P.M.	Feed In./Rev.	Speed R.P.M.	Feed In./Rev.	Speed R.P.M.	Feed In./Rev.
1/8	0.0 –0.125	0.180	0.7	1250	0.002	850	0.003	630	0.004	500	0.005	420	0.006
1/4	0.126–0.250	0.280	0.8	850	0.003	630	0.004	500	0.005	420	0.006	360	0.007
3/8	0.251–0.375	0.500	0.9	630	0.004	500	0.005	420	0.006	310	0.008	250	0.010
1/2	0.376–0.500	0.750	1.0	500	0.005	420	0.006	310	0.008	250	0.010	210	0.012
5/8	0.501–0.625	1.000	1.1	420	0.006	360	0.007	310	0.008	250	0.010	210	0.012
3/4	0.626–0.750	1.390	1.2	360	0.007	310	0.008	250	0.010	210	0.012	180	0.014
7/8	0.751–0.875	1.970	1.4	310	0.008	280	0.009	230	0.011	190	0.013	166	0.015
1	0.876–1.000	2.500	1.5	280	0.009	250	0.010	210	0.012	180	0.014	155	0.016
1 1/8	1.001–1.125	3.200	1.7	250	0.010	210	0.012	180	0.014	155	0.016	140	0.018
1 1/4	1.126–1.250	3.950	1.9	210	0.012	180	0.014	155	0.016	140	0.018	125	0.020
1 3/8	1.251–1.375	4.750	2.1	200	0.012	170	0.014	150	0.016	130	0.018	120	0.020
1 1/2	1.376–1.500	5.700	2.3	200	0.012	150	0.014	130	0.016	120	0.018	110	0.020
1 3/4	1.501–1.750	7.650	2.5	150	0.012	140	0.014	120	0.016	110	0.018	100	0.020

(a) Allowance for tool care shall be percentage shown per drill. Based on actual drilling time, using the nearest combination of above, available on machine. (b) Machine care by operator 4.0 per cent. Average 550 in. per drill per grind. The above table is based on approximately 2.5 in. travel and 55 ft. peripheral speed per min.

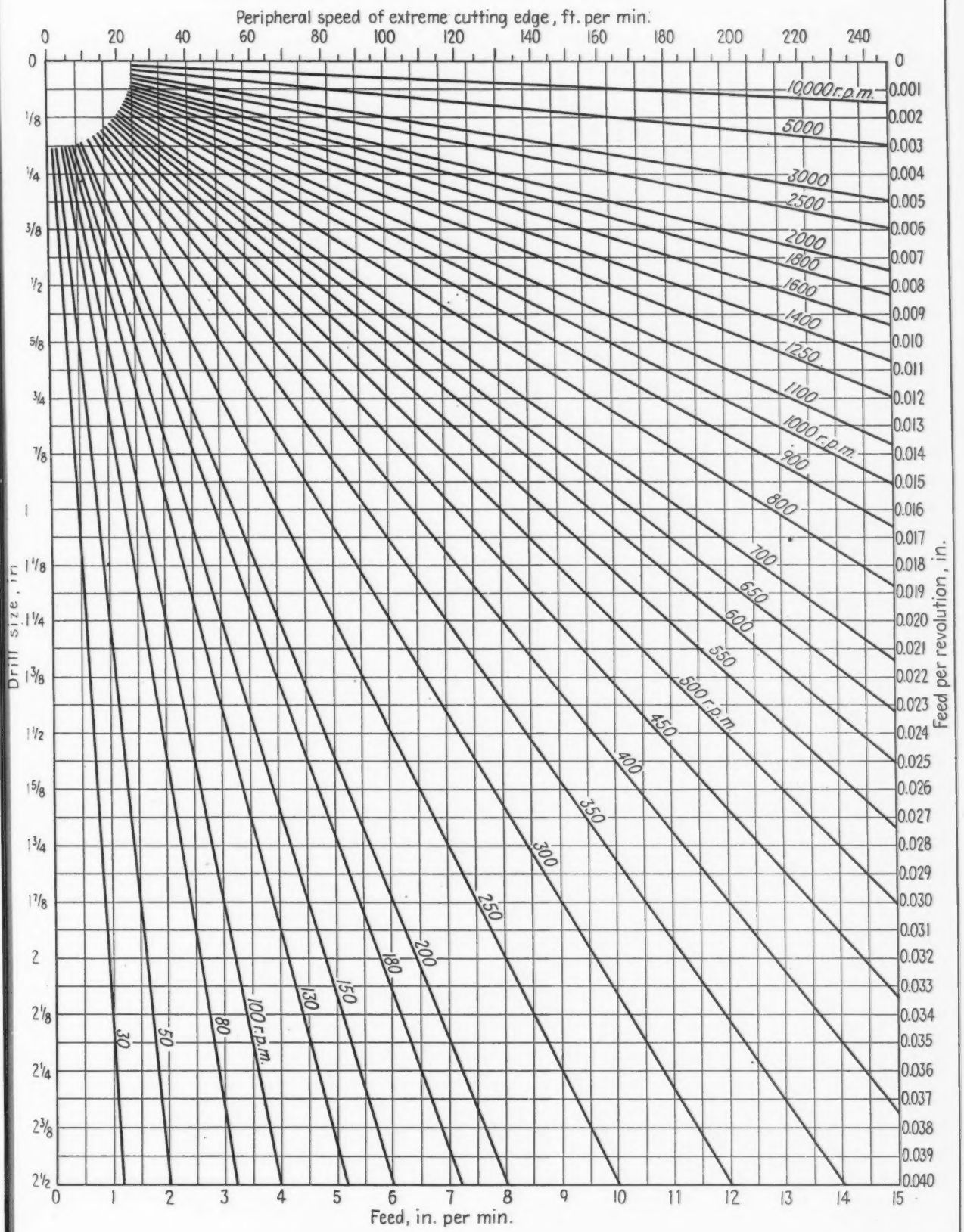


FIG. 2—Chart for converting drill speed in revolutions per minute to peripheral speed and for converting feed in inches per minutes to inches per revolution.

TABLE V

Elemental Time Allowances in Minutes for Hoist Up or Hoist Away

Approximate Weight Range, Lb.	Hook or Sling Type Hook Hoist Grasp			Chain Wrap Sling Type Hoist Grasp		
	Air Cylinder	Electric or Air Motor	Chain	Air Cylinder	Electric or Air Motor	Chain
36 to 100	0.35	0.50	0.75	0.40	0.60	0.80
101 to 300	0.50	0.75	1.25	0.75	1.00	1.50
301 to 750	0.75	1.00	1.75	1.00	1.25	2.00

TABLE VI

Elemental Time Allowances in Minutes to Position Jig

Weight of Jig, Lb.	Loose Jig	Internal Exp.	External Screw	Ring w/2 C Clamps	Ring w/1 C Clamp	Ring w/plier Grip Clamp
0 to 10	0.03	0.10	0.07	0.45	0.25	0.12
11 to 25	0.05	0.12	0.09	0.50	0.28	0.14
Over 25	0.07	0.14	0.11	0.55	0.30	0.16

container and returning to the machine. In many cases this can be performed during the drilling cycle without time allowance. Otherwise, 0.04 min. is allowed for pieces weighing 15 lb. or less; 0.05 min. for pieces weighing 16 to 35 lb. Hoist is used for pieces over 35 lb. in which case allowances are those made in Table V.

Machine Care Time

Allowance for care of multiple drilling machines is 4 per cent of work day time, as compiled from Tables I to IV. Machine care is defined as consisting of the following items: (1) At the beginning of work day period, operator shall properly lubricate all points of the machine that require daily care, based on machine manufacturer's recommendation; (2) check lubrication points at necessary intervals during work period, and add or lubricate when required; (3) keep machine clear and immediate work place in proper order consistent with good shop practice and to productive supervision's satisfaction; (4) clean machine of chips, and clear work place area, or equipment utilized to shop supervision's satisfaction, at end of productive day.

TABLE VII

Elemental Time Allowances in Minutes to Remove Jig

Weight of Jig, Lb.	Loose	Int. Exp.	Ext. Screw	Ring Type
0 to 10	0.03	0.04	0.03	0.03
11 to 25	0.05	0.06	0.05	0.05
Over 25	0.07	0.08	0.07	0.07

TABLE VIII

Standard Allowance for Proper Care of High Speed Steel Twist Drills (Machine Ground)

Size of Drill, In.	Decimal Range, In.	Allowance in Min. per Drill
1/8	0.0–0.125	1.20
1/4	0.126–0.250	1.42
3/8	0.251–0.375	1.64
1/2	0.376–0.500	1.84
5/8	0.501–0.625	2.10
3/4	0.626–0.750	2.40
7/8	0.751–0.875	2.80
1	0.876–1.000	3.15
1 1/8	1.001–1.125	3.60
1 1/4	1.126–1.250	4.00
1 3/8	1.251–1.375	4.40
1 1/2	1.376–1.500	4.80
1 3/4	1.501–1.750	5.25

Standard drill care is defined as consisting of the machine operator removing the drills from their spindles, transporting them to the proper tool crib for standard machine grinding, receiving them or a duplicate set from the crib, returning to the machine, inserting the drills into their respective spindles or chucks and performing necessary adjustments to assure proper height or depth of drill. Time allowances in per cent per drill as derived from Tables I to IV are the basic standard as proved by general shop practice and checked by accumulated data from time study and observation. Standard allowances in minutes are shown in Table VIII. The basic data is based on the average number of inches possible to drill in various metals specified consistent with utmost tool economy and maximum production and conforming to the fundamentals of good shop practice. Analysis of accumulated data made possible a conclusive arrival at a definite number of inches per minute which can be drilled in the various metals consistently.

It is recognized that, despite a large degree of production routine, unusual conditions or elements not taken into account in setting up standards will arise from time to time. Such situations must be considered individually, and allowances made and shown according to actual time necessary.

TABLE IX

Comparisons of Metal Removed Per Inch of Travel

Size of Drill, In.	Cubic Inches of Metal Removed Theoretically	Comparative Scale 1 In. Hole = 100 Per Cent
0.125	0.0123	1.56
0.250	0.0492	6.27
0.375	0.1100	14.00
0.500	0.1975	25.20
0.625	0.3060	38.90
0.750	0.4420	56.20
0.875	0.6000	76.50
1.000	0.7854	100.00
1.125	0.9950	127.00
1.250	1.2300	157.00
1.375	1.4850	189.00
1.500	1.7700	226.00
1.750	2.4100	307.00

Spot Welding Aluminum With Refrigerated Tips

. . . As many as 1600 spot welds were made on duralumin without redressing the refrigerated tip, but when welding DTD 390 Alclad sheet, no improvement is obtained in the amount of electrode pick-up with a refrigerated coolant. With both aluminum alloys, however, the amount of tip wear is reduced by the use of a refrigerated coolant. The data were supplied through the courtesy of the British journal, "Sheet Metal Industries."

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o o o

THE cooling of spot welding electrodes by means of a refrigerated fluid appears to have a wider application in America than in this country. This is probably due to the fact that users in this country have not obtained the results which have been claimed elsewhere. Two papers on research work on this subject have been published in America and a brief summary of the results obtained is given below.

Dr. Hensell[1] and his associates in making their experiments used a 150 kva, a.c. operated press type welding machine and the material welded was 24S-T Alclad sheet 0.04 in. thick. The sheets were prepared for welding by wire brushing the surfaces. Standard ⅝ in. diameter plug electrodes were used and the thickness of the copper between the welding surface or tip and the end of the cooling channel was ⅜ in. A dome tip shape having a 2 in. radius was used.

The main conclusions were:

(1) Skidding of the electrodes under pressure appears to aggravate pick up.

(2) A heavy coating of frost on the electrodes may cause blow outs.

(3) Operating at a speed of 50 welds per min. the maximum temperature obtained with refrigerant cooling is approximately 253 deg. F. Since the original brine solution had a temperature of —33 F. deg. the temperature differential is approximately 286 deg. F. The efficiency of refrigerant cooling at this speed does not seem to be impressive.

The author concludes by stating that definite benefits can be derived in standard a.c. spot welding with refrigerant cooling.

Dr. Hess[2] and his associates used a condenser discharge equipment in which the welding time was 0.042 sec. The material was Alclad 24S-T sheet 0.040 in. The sheets were decreased and a chemical surface treatment was used. Prior to welding the surface contact resistance of the sheet was recorded.

The conclusions reached were as follows:

(1) Under good welding conditions electrode pick up of aluminum can definitely be retarded by the use of refrigeration for cooling the electrode tips.

(2) The Frostpoint tip* is superior to the standard tip with respect to efficiency of heat transfer from face to coolant.

(3) The effect of moisture on electrode tips not only during but particularly during interruptions in welding may not be conducive to good tip life.

It was noted in this series of tests that adjustments had to be made to the condenser voltage to keep the weld strength at a desired level. An example of the results obtained in this investigation is given in Table I.

The above investigations were carried out on two different types of machine. On the a.c. operated welding machine a welding time of 0.13 sec. was used and as this value was more than three times that used on the d.c. operated machines, the results of the two tests are not comparable.

The work now completed was carried out on an electromagnetic stored energy resistance welding machine, using variable pressure cycle. A high pressure is used before and after welding and during the welding cycle the pressure is reduced to approximately one-third of the maximum value. The standard welding electrodes used on this machine are 1⅜ in. in diameter and the additional volume of copper in the region of the welding surface would provide additional cooling means when compared with the standard American electrode which is ⅝ in. in diameter. These two types of electrode are illustrated in Fig. 1.

A Prestcold Industrial CC4 refrigerator was used to feed a 50 per cent alcohol—50 per cent water mixture to the welding electrode at a rate of 1 gal. per min.

As a considerable quantity of un-

** The Frostpoint tip has a number of internal fins which increases the surface area in contact with the coolant and is therefore more efficient than the standard tip. It is made by the Frostrode Products Co., Detroit. Other tests on this tip, made at Eastern Aircraft Div. of General Motors Corp., are reported in the article, 'Super-Cooled Spot Welding Electrodes," by Charles C. Titherington,* THE IRON AGE, *Oct. 14, 1943, p. 94.*

coated duralumin is being used in some aircraft factories the tests included the spot welding of 5 L,3 duralumin (17S-T) and Alclad DTD 390 (24S-T). The sheet thickness was limited to 20 gage (0.036 in.).

Comparative tests were obtained for two electrode materials:

(1) Cold rolled electrolytic copper.

(2) ALW—A copper based alloy containing tellurium nickel and silver.

Preliminary tests were carried out on the following electrode tip shapes:

(*a*) Dome shaped tip having a radius of 1½ in.

(*b*) Flat electrode tip with conical base angle of 10 deg.

(*c*) Flat electrode tip with conical base angle of 20 deg.

With types (*a*) and (*b*) it was found that there was a tendency for the aluminum coating round the circumference of the weld depression to stick to the electrode and this was avoided by using type (*c*).

Preparation of Sheets

The test pieces were degreased in a trichlorathylene vapor degreaser and chemically cleaned before welding.

The efficiency of the cleaning method was checked by measuring resistance across a single thickness of sheet. A small strip 1 x 2 in. was cut off the test panel and placed between two copper electrodes, the total weight applied through the electrodes being 5½ lb.

The equipment[3] used indicates the effectiveness of the pickling operation and as the preparation of the material is probably the most important factor connected with pick-up during the welding operation, a considerable amount of preliminary work was carried out before deciding on the cleaning treatment to be adopted.

On some panels inconsistent cleaning results were found to be due to the protective lanolin coating and in order to avoid further difficulties all test material was obtained without any temporary rust preventative being applied. It was also noticed that some duralumin sheet surfaces were very rough due to roll marks and surface defects, and variable results were obtained on the resistance tests. In the final tests, duralumin sheets having a very good surface finish were obtained.

TABLE I

Test Results on Frostpoints Made at Rensselaer

Test No.	Average Coolant Temp., Deg. F.	No. of Welds Made Before Cleaning Became Necessary	Average Shear Strength, Lb.
31	0	2310	515.0
32	0	2509	531.8
33	40	1529	514.3
34	40	1445	521.5
35	40	1309	524.9
36	70	708	535.8
37	70	613	494.9

Welding speed 40 per min. Welding time 0.042 sec. approx.

The chrome-sulphuric acid pickle (5 per cent Cr. + 15 per cent H_2SO_4) was found to be suitable for cleaning these sheets prior to welding. The test panels were immersed in the pickle for 30 min., the temperature of the bath being maintained at 65 deg. C. After washing in cold water each panel was finally washed in distilled water and dried off in a hot air blast. With this cleaning method resistance values of less than 1 milliohm were obtained.

A considerable amount of experimental work has been carried out on the cleaning of aluminum coated sheets (Alclad LTD 390) and a number of chemical etches are now in use. Although low resistance values can be obtained immediately after pickling there is a tendency for the resistance to increase appreciably during the first hour.

Results of tests taken on uncoated and aluminum coated sheets are given in Table II. This increase of resistance which takes place after cleaning has also been referred to in a recent paper by Capt. James K. Dawson[4] of the Bell Aircraft Co.

Preliminary tests were made in which three methods of sheet preparation was used, namely:

(1) 5 per cent chromic + 15 per cent sulphuric acid at 65 deg. C.

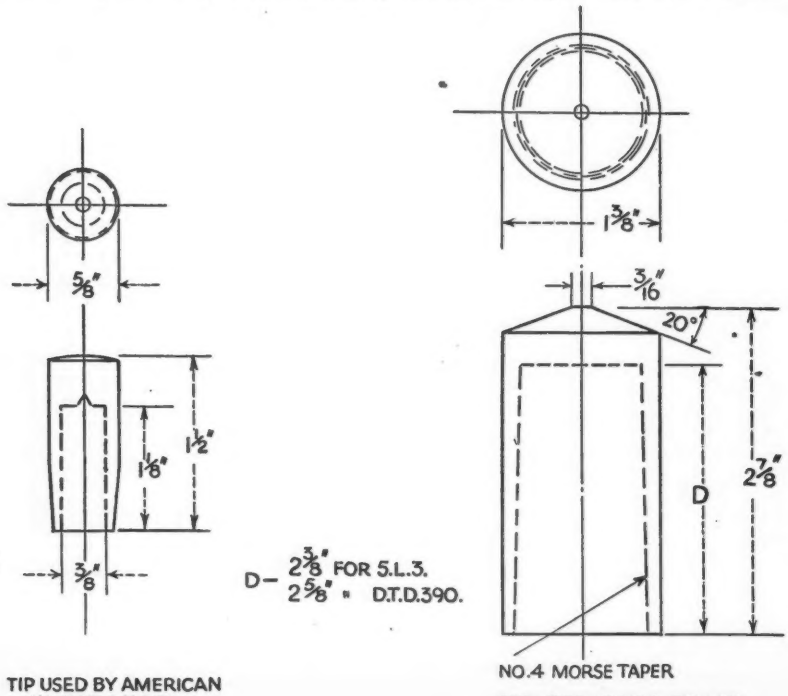
(2) 10 per cent phosphoric acid + 0.05 per cent wetting agent at 120 deg. F.

(3) Paste etch (hydrofluoric acid gum tragacanth).

Low initial resistance readings were obtained with the first two cleaning methods, but in the case of the paste etch the resistance readings were high and varied considerably. It was found, however, that the panels could be readily cleaned with a rotating wire brush after the paste etch treatment. Photomicrographs illustrating the varied nature of the etching action of each method of preparation are shown in Figs. 2, 3 and 4.

The chromic-sulphuric acid solution has an overall pitting effect, whereas the paste etch apparently produces less pitting and reveals the grain boundaries. The phosphoric acid

FIG. 1—Types of refrigerated tips used by American investigators and by the author.



TIP USED BY AMERICAN INVESTIGATORS.

NO.4 MORSE TAPER

TIP USED BY P.S.CO.LTD.

treatment appears to produce deeper pitting than the chrome sulphuric acid and also reveals the grain boundaries to a certain extent. For laboratory test purposes the following method of sheet preparation was found to be most suitable. Degrease and apply paste etch for five minutes. Wash off in cold water, dry in hot air blast and clean with a rotating wire brush prior to welding.

Description of Tests

The electrodes were carefully machined to size and for each test a new pair of electrodes were used. It was found that accurate alignment of the electrodes was essential and this was obtained by using a steel tube which was a sliding fit on the electrode. It was passed over the bottom electrode and when the electrodes were in the closed position the tube could only be moved on to the upper electrode when correct alinement was obtained. The tip faces were trued up by rotating a flat steel bar covered with fine emery cloth between the electrodes under pressure.

The test panels were 12 x 6 in. and 200 spot welds at approximately ½ in. pitch were made on each pair of panels. When welding the duralumin (5L3) panels it was found that at least 1200 spot welds could be made without cleaning the electrode tips. These tests were carried out using the water-alcohol mixture at 69 deg. F. and a normal circulation of 1 gal. per min. The skidding of the electrode tips under pressure did not seriously affect the amount of pick-up obtained when welding the uncoated material. A comparison was made between electrodes cooled with refrigerant and those cooled by the standard water cooling method.

The test run consisted of making 1200 spot welds with each pair of electrodes tested and after every 200 welds the tip diameter and weld strength were recorded. The test panels were overlapped 1 in. and six welds were made at 1 in. pitch. Single weld test pieces were cut from the panel and the first weld made was discarded. The actual contract area of the tip surfaces was recorded after every 100 welds. It was already known that the weld strength would decrease as the electrode diameter increased and no attempt was made to maintain the weld strength at its original value. On preliminary tests made with tip temperatures of 5 deg. F. difficulty was experienced with ice forming on the tips. Further tests indicated that little trouble was expe-

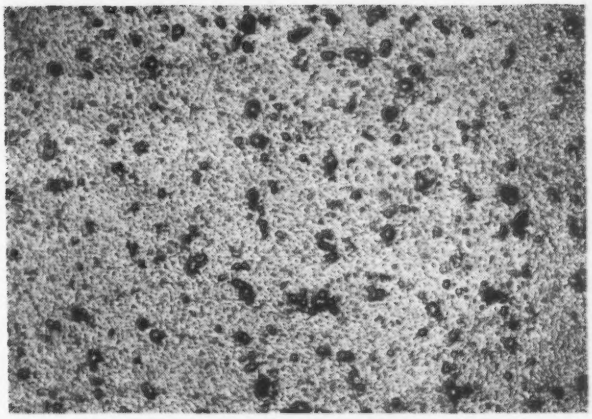


FIG. 2—Alclad LTD 390 cleaned with chromic - sulphuric acid solution.

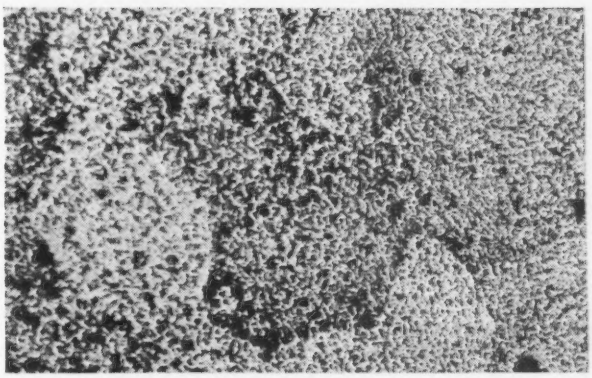


FIG. 3—Alclad LTD cleaned with phosphoric acid.

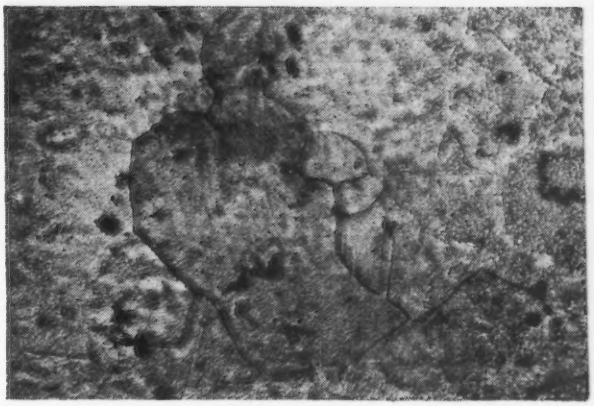


FIG. 4—Alclad LTD cleaned with hydrofluroic acid pate etch.

TABLE II

Resistance Values in Milliohms Following Cleaning of 20 Gage DTD 390 and 5L3 Aluminum Alloys

All readings taken are an average of 9

Time after Pickling, (Min.)	5	10	15	20	25	30	35	40	45
Material									
(a) DTD 390	0.9	1.2	1.5	1.5	1.2	1.6	1.8	2.1	1.6
5L3	0.3	0.4	0.5	0.7	1.0	0.5f	0.5	0.5	0.6
(b) DTD 390	1.1	0.9	1.2	1.3	1.6	1.9	2.3	1.9	2.4
5L3	1.0	1.0	0.8	1.0	1.0	0.9	1.0	1.1	1.3
(c) DTD 390	1.0	1.3	1.5	1.6	1.8	2.3	2.0	2.4	2.5
(d) DTD 390	0.9	1.1	1.3	1.2	1.4	1.3	1.6	1.7	1.9

(a) 5 per cent chromic acid plus 15 per cent sulphuric acid at 65 deg. C. for 30 min.
(b) 10 per cent phosphoric acid plus 0.05 per cent wetting agent at 120 deg. F. for 10 min.
(c) Paste etch for 5 min. Wire wool clean.
(d) Paste etch for 5 min. Cleaned with rotating wire brush.

TABLE III

Tip Wear in Spot Welding 5L3 Duralumin Sheet—20 SWG.

WITHOUT REFRIGERATION

No. of Welds	Average Temperature of Coolant Inlet, Deg. F.	Average Temperature of Coolant Outlet, Deg. F.	Breaking Load Per Weld in Lb., Average of 5 Welds	Electrode Tip Diameter, In.	Contact Area in Sq. In.
0	69	70	595	0.190	0.0233
100	..	..	..	..	0.0279
200	..	..	460	0.210	0.0294
300	..	..	..	..	0.0294
400	..	..	475	0.230	0.0302
500	..	..	..	..	0.0311
600	..	..	486	0.245	0.0341
700	..	..	..	..	0.0356
800	..	..	410	0.255	0.0380
900	..	..	..	..	0.0395
1000	..	..	430	0.265	0.0410
1100	..	..	..	..	0.0418
1200	..	..	390	0.270	0.4260
					0.04260

WITH REFRIGERATION

0	17	20	562	0.190	0.0233
100	..	..	..	..	0.0278
200	..	..	510	0.210	0.0294
300	..	..	..	..	0.0294
400	..	..	504	0.225	0.0294
500	..	..	..	..	0.0318
600	..	..	493	0.235	0.0326
700	..	..	..	..	0.0326
800	..	..	470	0.240	0.0349
900	..	..	..	..	0.0372
1000	..	..	454	0.250	0.0388
1100	..	..	..	..	0.0403
1200	..	..	420	0.255	0.0403

Machine: Electromagnetic stored energy type.*
Welding current setting: 225 amp.
Welding pressure—Before and after welding: 1090 lb. During welding: 308 lb.
Speed of welding: 30 welds per min.
Initial electrode tip diameter: 0.19 in.
Electrode material: Electrolytic copper.
*Note—The discharge time on this machine is 0.02 sec. (approx.).

TABLE IV

Tip Wear in Spot Welding 5L3 Duralumin Sheet—20 SWG.

WITHOUT REFRIGERATION

No. of Welds	Average Temperature of Coolant Inlet, Deg. F.	Average Temperature of Coolant Outlet, Deg. F.	Breaking Load Per Weld in Lb., Average of 5 Welds	Electrode Tip Diameter, In.	Contact Area in Sq. In.
0	65	66	525	0.190	0.0233
100	..	..	..	..	0.0249
200	..	..	555	0.195	0.0272
300	..	..	..	..	0.0279
400	..	..	575	0.205	0.0294
500	..	..	..	..	0.0311
600	..	..	528	0.215	0.0311
700	..	..	..	..	0.0311
800	..	..	490	0.220	0.0311
900	..	..	..	..	0.0318
1000	..	..	..	0.230	0.0326
1100	..	..	444	..	0.0335
1200	..	..	460	0.240	0.0348

WITH REFRIGERATION

0	21	24	530	0.190	0.0233
100	..	..	..	..	0.0264
200	..	..	550	0.200	0.0264
300	..	..	..	..	0.0272
400	..	..	530	0.205	0.0272
500	..	..	..	..	0.0272
600	..	..	540	0.210	0.0279
700	..	..	..	..	0.0294
800	..	..	490	0.215	0.0311
900	..	..	..	..	0.0328
1000	..	..	530	0.225	0.0328
1100	..	..	..	..	0.0335
1200	..	..	520	0.230	0.0335

Machine: Electromagnetic stored energy type.
Welding current setting: 225 amp.
Welding pressure: Before and after welding: 1090 lb. During welding: 308 lb.
Speed of welding: 30 welds per min.
Initial electrode tip diameter: 0.19 in.
Electrode material: ALW copper alloy.

rienced with tip temperatures around 20 deg. F.

Before welding and at shut down periods the electrode tips were wiped with a cotton rag dipped in glycerine. It was found that shut down periods lasting several hours had no apparent effect on the results obtained after restarting.

Spot Welding of Alclad

Before carrying out the final test runs on Alclad DTD 390 two methods of mounting the electrodes on the welding machine were tried out. One setup allowed the upper electrode to rub or skid slightly across the weld surface and the other prevented this skidding from taking place. The tests indicated that the slight movement probably caused by the increased pressure immediately after welding was preferable.

Trial test runs indicated that with the standard type electrode having ½ in. thickness of copper between the electrode tip and cooling liquid, not more than 20 welds could be made without the aluminum surface of the weld being disturbed. This slight pitted appearance on the weld surface was considered to be the commencement of the aluminum sticking to the electrodes. The use of refrigerated tips gave no improvement. By reducing the thickness of copper between the tip and cooling liquid to ¼ in. the number of welds was increased to 60.

Using normal cooling methods further efforts were made to increase the number of welds made without disturbance of the aluminum surface. This could only be achieved by solution heat treatment of the test panels in a salt bath prior to the cleaning operation. On panels thus treated 200 spot welds were made before sticking occurred. This improvement was not maintained when the test panels so treated were allowed to age harden. It is fully realized that it would be impossible to carry out such an operation when producing spot welded parts, but it may indicate that the use of a pre-heating current may be an advantage when spot welding this material.

It was also found that by continuing to weld after the initial sticking occurred the weld surface appearance improved and the tendency towards sticking was considerably reduced. In making the final test runs of 1200 welds it was decided therefore to con-

tinue to weld after the initial sticking occurred.

It should be noted that owing to the increased welding current for the spot welding of Alclad compared with that used on duralumin the welding speed was considerably reduced. When a choke is discharged the current .time curve has a considerable tail towards the end of the discharge. This has a tendency to cause sparking between the upper electrode tip and the sheet, and in order to overcome this fault a longer dwell period after welding is necessary. It was found in all tests that the upper electrode had a greater tendency to stick than the lower one. The polarity of the upper electrode was negative.

Discussion of Results

This investigation clearly indicated that the uncoated sheet 5L3 is less troublesome to weld than the Alclad sheet DTD 390.

The refrigerated coolant was found to reduce the amount of wear on the electrode tips and the results indicate that the weld strength is maintained over a long test run. Using carefully prepared duralumin test panels 1600 spot welds were made without redressing the refrigerant cooled tips, but a slight trace of grease, imperfections on the sheet surface, faulty cleaning, incorrect alinement of the electrodes, and incorrect face-to-face contact of the electrode tips will greatly reduce the number of welds made without sticking.

When welding DTD 390 it was found that more efficient cooling of the electrode tip produced a greater number of spot welds before sticking occurred. It was therefore assumed that the use of a refrigerated coolant would result in a further improvement being obtained. This was not found to be so and may indicate that by using specially designed electrode tips and standard water cooling methods further improvement would be obtained. Hensell states that the efficiency of refrigerant cooling does not seem to be impressive and this suggests that the controlling factor may not be the initial temperature of the tip surface but the proximity of the cooling liquid to it.

In this series of tests the tip wear was reduced by the use of a refrigerated coolant, but it was difficult to detect any marked increase in the number of welds which could be made before sticking occurred.

Regarding the test on electrode materials, the new copper based alloy ALW appears to be preferable to

TABLE V
Tip Wear in Spot Welding DTD 390 Alclad Sheet—20 SWG.

WITHOUT REFRIGERATION

No. of Welds	Average Temperature of Coolant Inlet, Deg. F.	Average Temperature of Coolant Outlet, Deg. F.	Breaking Load Per Weld in Lb., Average of 5 Welds	Electrode Tip Diameter, In.	Contact Area in Sq. In.
0	64	65	518	0.190	.0233
100	..	..			0.0310
200	..	..	564	0.230	0.0310
300	..	..			0.0310
400	..	..	456	0.240	0.0325
500	..	..			0.0341
600	..	..	500	0.250	0.0356
700	..	..			0.0381
800	..	..	464	0.260	0.0395
900	..	..			0.0418
1000	..	..	446	0.270	0.0426
1100	..	..			0.0426
1200	..	..	430	0.275	0.0426

WITH REFRIGERATION

0	18	20	522	0.190	0.0233
100	..	..			0.0294
200	..	..	554	0.230	0.0302
300	..	..			0.0302
400	..	..	510	0.240	0.0341
500	..	..			0.0341
600	..	..	460	0.250	0.0356
700	..	..			0.0387
800	..	..	444	0.255	0.0387
900	..	..			0.0395
1000	..	..	440	0.260	0.0410
1100	..	..			0.0418
1200	..	..	428	0.270	0.0426

Machine: Electromagnetic stored energy type.
Welding current setting: 250 amp.
Welding pressure—Before and after welding: 1090 lb. During welding: 308 lb.
Speed of welding: 18 welds per min.
Initial electrode tip diameter: 0.19 in.
Electrode material: Electrolytic copper.

TABLE VI
Tip Wear in Spot Welding DTD 390 Alclad Sheet—20 SWG.

WITHOUT REFRIGERATION

No. of Welds	Average Temperature of Coolant Inlet, Deg. F.	Average Temperature of Coolant Outlet, Deg. F.	Breaking Load Per Weld in Lb., Average of 5 Welds	Electrode Tip Diameter, In.	Contact Area in Sq. In.
0	69	70	585	0.190	0.0233
100	..	..			0.0294
200	..	..	518	0.220	0.0302
300	..	..			0.0310
400	..	..	488	0.230	0.0310
500	..	..			0.0310
600	..	..	434	0.240	0.0325
700	..	..			0.0325
800	..	..	444	0.245	0.0341
900	..	..			0.0341
1000	..	..	456	0.245	0.0341
1100	..	..			0.0356
1200	..	..	396	0.255	0.0380

WITH REFRIGERATION

0	18	19.5	600	0.190	0.0233
100	..	..			0.0294
200	..	..	584	0.220	0.0302
300	..	..			0.0302
400	..	..	578	0.230	0.0310
500	..	..			0.0310
600	..	..	514	0.230	0.0310
700	..	..			0.0310
800	..	..	540	0.240	0.0325
900	..	..			0.0325
1000	..	..	516	0.245	0.0341
1100	..	..			0.0341
1200	..	..	506	0.250	0.0356

Machine—Electromagnetic stored energy type.
Welding current setting: 250 amp.
Welding pressure—Before and after welding: 1090 lb. During welding: 308 lb.
Speed of welding: 18 welds per min.
Initial electrode tip diameter: 0.19 in.
Electrode material: ALW copper alloy.

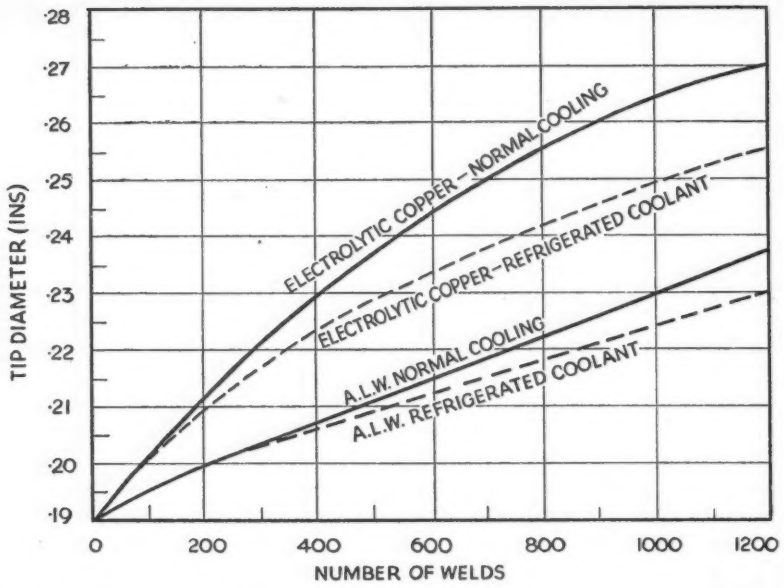


FIG. 5—Comparison of tip wear with normal and refrigerated coolant when spot welding 5L3 duralumin sheet with two types of electrodes, ALW is a copper base alloy containing tellurium nickel and silver.

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electrolytic copper although the frequency with which sticking occurs was not reduced. The test figures for the electrolytic copper electrodes are given in Tables III and V and for the ALW alloy in Tables IV and VI. The results obtained on the spot welding of 5L3 sheet are represented graphically in Fig. 5 and for the DTD 390 sheet in Fig. 6.

When comparing these figures it should be noted that the test results for duralumin sheet were obtained using a ½ in. copper thickness between the electrode tip and the coolant, whereas the copper thickness was reduced to ¼ in for the Alclad sheet.

Suggestions for Further Research

(1) The use of refrigeration for cooling electrodes reduces the amount of tip wear obtained during a number of welding operations.

(2) When welding DTD 390 Alclad sheet no improvement is obtained in the amount of electrode pick up with a refrigerated coolant. A slight improvement is obtained when welding 5L3 duralumin sheet. It is difficult, however, to retard electrode pick up, and the following factors have an important bearing on the results obtained:

(*a*) Machine settings.

(*b*) The correct alignment of the electrodes and electrode tip surfaces.

(*c*) Sheet surface condition.

(*d*) The type of protective coating used by the suppliers to prevent corrosion during shipment and storage.

(*e*) The cleaning of the sheet prior to welding.

(3) The efficiency of cooling the electrode appears to influence the retardation of electrode pick up and further research work is necessary to determine whether the proximity of the coolant to the tip surface is more important than the initial tip temperature.

(4) The solution heat treatment of Alclad sheet prior to cleaning and welding considerably retards electrode pick up. Further research work should be carried out to determine if preheating on the machine immediately before welding would produce similar results.

(5) Chemical etches used for cleaning DTD 390 sheet have different forms of attack. A further study of the sheet surfaces after etching may assist in determining the most suitable etching agent.

(6) The copper alloy (ALW) containing tellurium nickel and silver is preferable to electrolytic copper as electrode material for the spot welding of 5L3 and DTD 390 sheets.

The author wishes to thank the management of the Pressed Steel Co., Ltd., for permission to publish this work.

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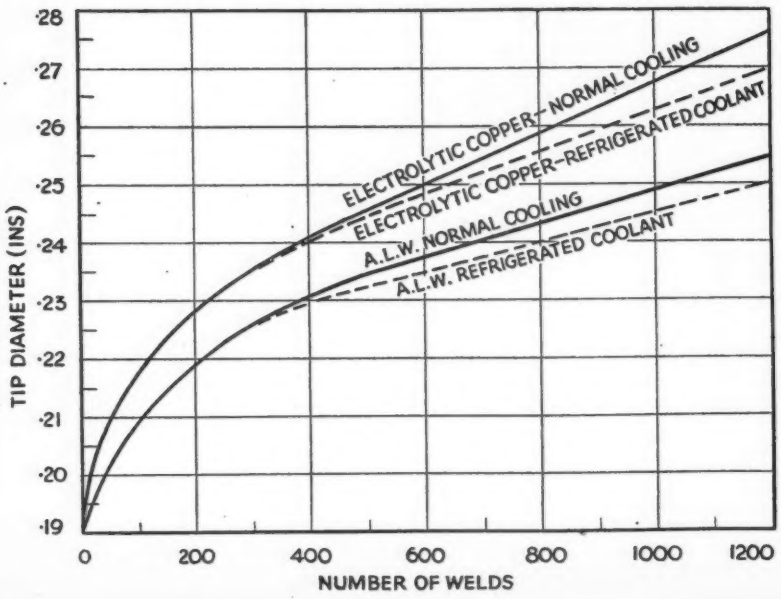
FIG. 6—Comparison of tip wear with normal and refrigerated coolant when spot welding Alclad DTD 390 20 S.W.G. sheet with two types of electrodes.



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[3] Inspection of cleaning methods for Light Alloy Sheets.—*Welding Journal*, Oct. 1943, pp. 462-463.

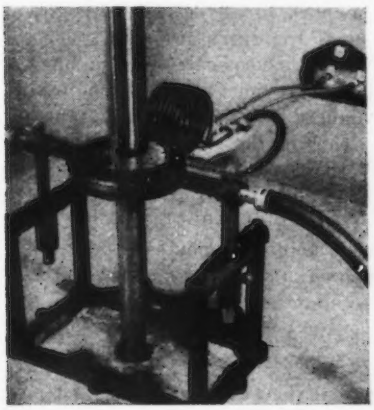
[4] Capt. J. K. Dawson. Production Spot Weld Testing.—*Welding Journal*, Feb. 1944, pp. 108-111.

New Equipment . . .

Heat Treating and Process Control

. . . Recent developments in induction heating equipment, heat treating furnaces and process controls are described in the following pages.

FOR continuous progressive heating and quenching in the surface hardening of shafting and tubing of any length, a new process has been



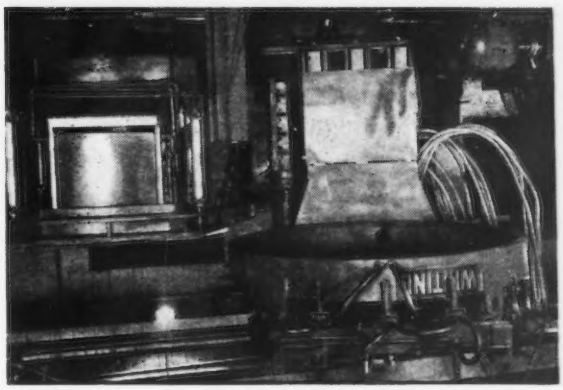
developed by *Lepel High Frequency Laboratories, Inc.*, 39 W. 60th Street, New York 23. Because of the high frequencies developed by the spark-gap operated equipment, 100,000 to 450,000 cycles, heating is so rapid and the time at heat is so short that even normal grain growth does not take place, making it possible to use ordinary carbon steel in many applications. The process develops a superhard skin with superior wearing qualities. The speed of heating and short time at heat prevents surface decarburization and scaling. Ground shafting or tubing may be hardened without the need for finishing after quenching. Also because of the short heating cycle, the core structure is unchanged and highest ductility is maintained. Distortion is said to be minimized regardless of the length of the part and the depth of hardness can readily be controlled.

Electric Melting Furnace

A SWING-ASIDE, top charge, electric furnace which has hydraulic, air counterbalanced, electrode positioning control has been announced by *Whiting Corp.*, Harvey, Ill. Small cylinders of standard make raise and swing the roof. The weight of the electrodes, electrode arms and electrode arm supports are suspended from the swing column at the side of the furnace at all times. The weight of the roof is distributed uniformly and symmetrically over the entire periphery of the wall refractory. The furnace has a capacity of 12,000 lb. and a melting rate of from 6000 to 8400 lb. an hr. It uses a 3000 Kva. transformer.

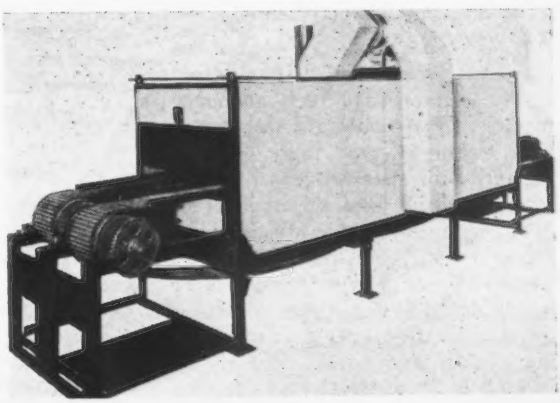
Experimental Oven

A SELF contained oven has been developed for laboratory and pilot plant use by *Industrial Oven Engineering Co.*, 11621 Detroit Avenue, Cleveland 2. Sizes of working space in the oven range from 3x3x3 ft. to 6x6x6 ft. in increments of 1 ft. Special sizes are furnished to specification. Temperatures range up to 900 deg. F. with a guaranteed differential of ±2 deg. This type of oven is usually furnished with electrical heating equipment but is designed to use any type of fuel. The heating equipment is contained within the oven shell. Designed particularly for precision experimental work in drying, baking, evaporating, polymerizing, aging and heat treating especially in cases where highly volatile solvents are used, the oven can be furnished with special construction to withstand corrosive fumes.



Conveyor Oven

OFFERING many combinations of drying, baking or heat treating operations, a continuous heat processing oven has been developed by *Gehnrich Oven Division of W. S. Rockwell Co.*, 50 Church Street, New York. Designed specifically for preheating and baking electronic devices (zinc die castings assembled with the necessary paper, copper, plastic disks and vacuum tubes), the oven presents, however, possibilities, for applications in many other fields. Each wire-mesh belt conveyor running between angle guides is provided with a speed reducer roller chain and a variable speed pulley drive. One drive mechanism is mounted on the bottom base at each end of the oven. This permits operation of the conveyors at any desired speed



in the same or opposite directions. While the overall size of the oven is only 15 ft. long and 3 ft. wide, the design is flexible enough to permit any required dimensions and variation of construction details to meet specific production, time and temperature cycles.

Foundry Flasks

HEAVY duty welded steel foundry flasks designed for installation with straight or cut to pattern flash bars have been announced by *Algoma Products*, 3080 E. Outer Drive, Detroit 12. Features of the unit include taper wedges to fit the clamps, sand holes to insure sand retention, round corners for strength and convenience in handling and "scarfed" fins. The flasks are welded of hot rolled steel normalized after fabrication.

Fire Resistant Chemical

A FIRE resistant chemical for treating wooden foundry flasks, Fi-Retard Liquid, has been announced by *General Detroit Corp.*, 2270 E. Jefferson Avenue, Detroit 7. It is applied by dipping the flasks in the liquid. The chemical solution is absorbed into the wood and does not change the dimension of the flasks in any way. It is furnished ready to use in 1, 4½ or 30 gal. containers. The color in solution is a dark blue which dries out to acquamarine.

Electric Contact Controls

TWO types of electric contact controls for circular chart electronic potentiometers have been announced by *Brown Instrument Co.* One contact is a locking-in type relay, designed primarily for electric furnace control. It can also be used for applications involving the use of contractors and for processes requiring a differential gap. The second type, without a relay is designed for direct control of motorized valves, operation of signaling devices and applications requiring a "dead" neutral.

Furnace Injection Lens

THE development of an improved lens, Type O, for its "Cat's-Eyes" to permit visual inspection of boiler and furnace interiors and their contents while in operation has been announced by *Ess Instrument Co.*, Fort Lee, N. J. The improved lens provides a wider field of vision with less reduction than is available through a standard type G lens. Both are interchangeable. Use of the Type O lens will show at a glance the flame with its characteristics of color, turbulence and haze and objects inside a boiler or furnace such as tubes and articles being heat treated.

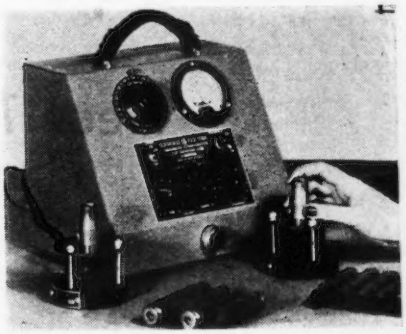
Foundry Shakeout Units

TWO single unit shakeouts, known as the Foundromatics, have been announced by *Allis-Chalmers Mfg. Co.*, Milwaukee 1. The larger, illustrated, is 8 x 10 ft., 25 ton load. The smaller is 6 x 8 ft. and is rated at 15 ton capacity. Increase in capacity is accomplished by the use of two bearings instead of the conventional

four bearing construction, by the elimination of outer bearings and by resilient support springs at each end of the shakeout. Vibratory action is produced by the combined effect of a heavy duty eccentric shaft and two true running balance wheels which counterbalance the weight of the shakeout. The result is said to be a uniform circular motion throughout the deck surface.

Magnetic Comparator

A MAGNETIC comparator for quick, simple and non-destructive inspection of ferrous parts for quality control has been announced by *General Electric Co.*, Schenectady. Features of the redesigned comparator include graduated dial plates on the sensitivity and balance control



rheostats to allow duplication of settings, a light which indicates whether power is on and receptacles for making connections to the test fixtures. The power source is now located at the back of the case, keeping wires out of the operator's way. The comparator incorporates all the functions of the previous model. The circuit is balanced by placing an acceptable part in each of the two test fixtures. One of these parts is then removed and those to be tested are individually inserted. Any deflection of the instrument pointer indicates a deviation in magnetic characteristics from that of the standard.

Electronic Pouring Control

FOR the automatic control of pouring operations in foundries a photoswitch photoelectric control type A20C has been announced by *Photoswitch, Inc.*, 77 Broadway, Cambridge 42, Mass. One operator working from a remote section can control the pouring of several ladles simultaneously. As each of the group of empty molds moves into position before a ladle, a control mounted directly above watches through a viewing tube. When the molds are in place, the operator through push button control of the hydraulic actuating mechanism tips the ladles and pours the molds. As the metal reaches the riser of each mold, a brilliant light is given off, which actuates the electric "eye." Photoswitch instantly drops the ladle back and the pouring stops. An adjustment on the control housing may be set so that the control will remain inoperative at one level of illumination but will be actuated when the amount of light reaching the phototube varies slightly. It can therefore be used to indicate and control the density of gases as well as turbidity in liquids. Type A20C also can distinguish between a clear liquid such as water and air above it or can detect an interface between two liquids differing slightly in translucency.

Inspecting cylinder finning tools in the Wood-Ridge plant of the Wright Aeronautical Corporation. Photograph courtesy the Wright Aeronautical Corp.

Cool Millions WITH THE HELP OF JONES & LAMSON *Optical Comparators*

This book "Beyond a Shadow of a Doubt" will tell you more about our Optical Comparators and what they are doing.

Proper dissipation of millions of heat units from the cylinders of the 2200 H.P. Wright Cyclone 18's that power the B-29 Superfortress, depends upon the perfection of the cylinder fins. To be sure that these fins are accurate —beyond a shadow of a doubt—the tools that cut them from solid metal are inspected on Jones & Lamson Optical Comparators.

Quality control by the inspection of tools, parts and products, with Jones & Lamson Optical Comparators, is an accurate, rapid process. Objects that require hours to inspect by other means can be inspected in minutes, or even seconds.

JONES & LAMSON
MACHINE COMPANY
Springfield, Vermont, U.S.A.

Manufacturer of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers.

Assembly Line . . . STANLEY H. BRAMS

• Material and parts orders for automobiles are confirmed, in line with WPB's go-ahead on a start to production . . . Chevrolet's quota is 45,000; Ford's is 40,000.

DETROIT—Purchasing departments of the automobile companies moved into high gear this week, implementing the conditional orders placed in some cases last summer and awaiting activation since then. The requests for shipping dates and schedules for shipments involve both raw material suppliers, like steel mills, and parts and accessories manufacturers.

There are more than a half-million tons of automobile steel on various mill order books today, but only 300,000 or so are being scheduled at this time to cover the initial allocations for the balance of this year for 214,678 passenger cars. But another batch of steel orders can be expected during the coming few weeks to cover allotments of light civilian trucks, manufacture of which was discussed in Washington last Friday to cover essential requirements. These trucks will be built in the fourth quarter, it appears, and probably they will be manufactured under priority. Conceivably the requirements for this program will cast a bit of a shadow over the unrated automobile steel needs.

Some steel companies are in a minor quandary at this immediate moment, on auto steel shipments, although they expect their problems to be ironed out shortly. To date they have not received full details from Washington on their forthcoming programs and responsibilities to the extent that they will be able to schedule on a hard-and-fast basis.

Decision of WPB to eliminate all special directives can be expected to help make automobile steel available, however. The elimination means that whenever any cancellations occur, the open space on mill books will not be filled up again at once with rush requirements. Rather, unrated steel orders like those from the car companies will fill the open spaces.

Any plate cancellations which develop, then, will likely act to the benefit of automobile sheet requirements, inasmuch as about the same kind of facilities are used. However, one subsidiary problem is created in changing over to sheets from plates, because more manpower is needed. With the supply of manpower still short, this may prove bothersome.

On the subject of sheets, some difficulty is generally expected among the car companies as to drawing qualities impaired by residual alloys. For the most part, mills do not expect this to be a consideration of major importance. Some aluminum killed steel, extra cost and all, is being ordered by some of the companies as insurance against drawing difficulties. There is a tendency, however, for some of the auto makers not to use killed steel for all parts which must be drawn and to simply go on the premise that normal or near-normal quantities in low carbon sheet will be provided.

Allocations for individual companies are expected momentarily. They will be based largely on the historical averages which governed the cutbacks in passenger car volume which preceded complete shutdown of the industry in early 1942.

Because this same basis is being used, it becomes possible to predict with fair accuracy just what these individual company allocations will total. These are the round figure anticipations:

General Motors	90,000
Chrysler	45,000
Ford	40,000
Crosley	1,000
Hudson	7,000
Nash	6,000
Packard	6,000
Studebaker	9,000
Willys	2,000
Unallocated	9,000

The unallocated portion will be used partially to meet requirements

DISCHARGED ON POINTS: *Still in his combat engineer's uniform, a U. S. Army veteran with 88 points to his credit is being interviewed by a Veteran Rehabilitation Interviewer for the Wright Aeronautical Corp. He has been hired to help build B-29 engines.*

BULLARD
MAN-AU-TROL V.T.L.
combines unlimited flexibility with the production speed of special purpose machines

. . . *thanks to* MAN-AU-TROL

the automatic control that is as versatile as manual control

This new Bullard MAN-AU-TROL V.T.L. differs from ordinary automatic machines because it is *first* a manually-operated machine. It is not committed to any definite sequence of functions until the operator runs one piece through completely . . . manually bringing the tools through each cut . . . making a simple MAN-AU-TROL automatic setting at the end of each cut.

When all operations have been completed and all function stops set, the operator moves a single lever and MAN-AU-TROL's automatic cycle takes over . . . doing the work faster and more accurately than manual operation . . . while the operator supervises, loads and unloads. When required, he can revert to manual operation without affecting the automatic set-up.

Set-up time from one job to any other of the endless variety of jobs within the scope of a MAN-AU-TROL V.T.L. is little more than for an ordinary manually-operated machine.

For further reasons why the new Bullard MAN-AU-TROL V.T.L. increases shop efficiency and lowers production costs, write for booklet A.

The Bullard Company, Bridgeport 2, Connecticut.

BULLARD CREATES *NEW METHODS* TO MAKE MACHINES DO MORE

of Graham-Paige Motors Corp., whose moves indicate full intention of getting back into the automobile sales arena, if not ability to do so. Another share of it will probably be given to Willys-Overland Motors, which has steadfastly protested its treatment in earlier preliminary authorization schedules. Beyond that there might be some later shortening of quotas of companies which are unable to fill their full allotments during the last months of this year, and whose steel, consequently, will probably be transferred to other concerns.

Interest develops in how the major producers will break down their quotas as between divisions. There probably will be a considerable divergence of handling here. It would appear that Chrysler Corp. might give a comparatively small portion to De Soto, which is burdened with B-29 work, and which is the smallest seller of the line. This would amplify the Plymouth and Dodge allocations, where the big volume exists. Such a move could easily be done, inasmuch as all De Soto dealers also sell Plymouths.

Similarly, Mercury and Lincoln probably may undergo some de-emphasis to provide a bigger volume at the start for Ford.

Within General Motors an approach of that sort would not be so feasible, inasmuch as all the five car-making divisions function fairly autonomously with regard to dealerships as well as in other ways. Chevrolet will absorb around half of the GM total, or 45,000, and the others will probably produce in about their normal proportions, with Buick the next largest, then Pontiac and Olds, with Cadillac comparatively minor.

All companies will probably concentrate their production on certain models of their lines rather than producing complete complements of body types. Particularly will this be true in the case of General Motors, where war-shortened press facilities dictate utmost economy in the use of body-making facilities at the start of the model year.

Says Full Efficiency Of Rocket Power Has Yet to Be Achieved

Chicago

• • • **Alloys capable of** withstanding higher temperatures than those already developed will be necessary to achieve the full potentialities of rocket power, G. Edward Pendray, secretary of the American Rocket Society and assistant to the president of Westinghouse Electric Corp., told the Chicago Chapter of the American Society for Metals recently.

Jet propulsion has not reached its maximum efficiency in use on aircraft of conventional design, Mr. Pendray said, pointing out that this point is reached only when moving at or above the speed of the jet.

He said that there are now at least five kinds of engines and motors operating on the principle of jet propulsion or rocket power. In the chemical fuel classification are the dry fuel motors which propel such devices as military rockets, anti-aircraft rockets and sky rockets, and the liquid fuel motors which provide power for high altitude sounding rockets and the long distance military and possibly mail and express rockets of the future. In the airstream engine group, which use oxygen from the air to support combustion of their fuels instead of supplying it in the form of liquid oxygen or chemicals, are the thermal jet engines of the kind used to propel fast aircraft here and in England and the duct engines, including the intermittent type used on German robot bombs and the continuous duct type with possible use as an auxiliary aircraft engine.

Illustrating new concepts in the jet field, he pointed out that both thermal and mechanical efficiency in an internal combustion engine is measured in shaft horsepower whereas they must be considered separately in the jet field. Thermal efficiency, expressed in the velocity of the jet, has reached 40 to 45 per cent, he declared.

250 Workers Laid Off

Milwaukee

• • • **About 250 workers** have been released as the result of a $15,000,000 cutback in the production of P-47 propeller blades at the W. Capitol drive plant of the A. O. Smith Corp., Milwaukee.

The cutback represents less than 25 per cent of the total propeller blade contract. It was ordered as a result of reduction in P-47 plane production. No further cutbacks are said to be expected immediately.

Vilter Mfg. Co. Sold To Foundation, Inc., A Non-Profit Company

Milwaukee

• • • **A most unusual business** transaction was the sale of the Vilter Mfg. Co., organized in 1867, to a non-profit, non-stock corporation to be known as Foundation, Inc. It is understood that more than $1,250,000 was involved.

Notices posted at the plant announced that "there will be no stockholders, and all profits from the operations of the company will accrue to Foundation, Inc., which, in turn, will dispose of those profits to certain designated beneficiaries."

The company said that employees and war veterans in need of rehabilitation would be included among the primary beneficiaries. The company employs about 1000 workers.

E. B. Tilton, formerly executive vice-president, general manager and treasurer of the company, has been named president of the Vilter Mfg. Co. and president and a member of the board of directors of Foundation, Inc. He will continue as general manager and treasurer. He said that the board of directors of Foundation, Inc., is "composed of outstanding men, well known in Milwaukee industry."

Mr. Tilton said that plans of Foundation, Inc., would be explained after completion of organizational details. He added that former owners of the company were withdrawing from all participation in the firm.

In 1886 the company was incorporated under the name of the Weisel & Vilter Mfg. Co. In 1892 the plant was destroyed by fire, but the company immediately started rebuilding operations on the present site.

The company was reorganized in 1892 under the name of The Vilter Mfg. Co., and under the leadership of Theodore Vilter the company developed rapidly with the advancement in the science of refrigeration. Its principal customers during this time were the breweries, packing houses, cold storage plants, ice plants and dairies. The brewing industry in particular was a large user of Vilter equipment.

The company began the manufacture of 105 howitzers for the Army in 1940, and in 1943 entered into a contract with the Navy for the manufacture of self-contained ice-making machines.

Headquarters FOR SPECIAL TOOLS FOR SPECIAL NEEDS

Photographs by courtesy of The Timken-Detroit Axle Co.

BORING · REAMING · THREADING with *One Tool!*

Here, for example, is a special combination Machine Tap designed by MURCHEY to meet a particular and highly specialized requirement. Taps 5-9/16" on front and rear axle housing. This machine has been in operation for 23 years and has been equipped with MURCHEY Taps over the complete period of time. The Taps being employed are special and are used on a double end Barnes machine. A forward boring head is mounted on the Tap so that rough boring, reaming and threading is done with one tool. Let us work with you on your requirements.

MURCHEY MACHINE & TOOL CO.
DETROIT 26, MICHIGAN

Put your
REQUIREMENTS UP TO
MURCHEY

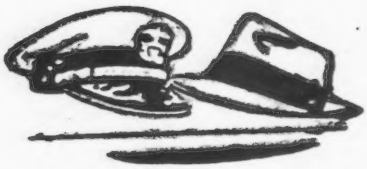
● *Murchey manufactures all types of Collapsible Taps, Self Opening Die Heads, Thread Milling Machines and Shell Tapping Machines. Write for Catalogues. Address Dept. I.*

MURCHEY

Washington . . . .

L. W. MOFFETT

• OPA may be forced to defend price increases before Emergency Court of Appeals . . . Price decision shows intention of preventing further increases.



WASHINGTON—OPA in approving increased steel prices it says will amount to between one and two per cent stands a good chance of having to defend its policies before the Emergency Court of Appeals.

Non-integrated steel companies said that serious consideration is being given to taking an appeal to the Court which was set up under the Price Stabilization Act of 1942.

This court has exclusive jurisdiction over price matters and appeals from its decisions are taken direct to the Supreme Court upon issues the Supreme Court recognizes as falling within its jurisdiction.

The non-integrated companies said that OPA disregarded three major factors of cost in the business of small companies. They were said to be: high cost of raw materials, amortization of emergency war facilities, and the adjustment of wage inequities ordered by the War Labor Board.

Non-integrated companies organized a committee on April 8, through which they attempted to convince OPA of the fact that its policies of delaying price increases before OPA acted were causing them to lose hundreds of thousands of dollars.

The Committee said that on May 21 because of the inadequacy of OPA steel price increases that "the very existence of these companies and the livelihood of their employees are at stake."

The small steel company group further noted that before the recent wage advance, losses on carbon steel products ran as high as $9 a ton and that against these losses, the amount restored by OPA by the present increase averages only about $2 a ton on the total output.

Emphasizing their precarious position the non-integrated companies said that even this advantage would disappear if current large volumes were to drop.

Said the Committee:

"Profitable business is rapidly disappearing in steel. One typical company which last year was showing a loss on 70 per cent of its total business is now showing a loss on 90 per cent.

"This is partly due to cutbacks and changes in war orders. Higher priced specialty items needed at the height of the war effort are in constantly less demand.

"The situation all points up to the fact that the present price increases are unrealistic and wholly unacceptable to the non-integrated companies."

When OPA announced interim increases on Jan. 11, it said that the adjustment and further product adjustments were minimums and had to be made as a matter of law without regard to any wage awards made by WLB.

In its statement of considerations, made in amending Price Schedule 6, OPA reversed itself and said that two of the fringe awards amounting to 4c and the increased cost of coal because of wage increases in that industry were being reflected in steel price increases.

The net effect of this statement is an apparent attempt by the price agency to prevent the steel companies from asking for and receiving additional price increases to offset the wage increases.

While OPA's attempt to stall off inflation is unquestionably praiseworthy, OPA has done some peculiar things, of which the foregoing is not the least confusing.

It told the steel companies that its original request for price increases amounting to about $150,000,000 should be granted to compensate for out-of-pocket losses, "as a matter of law." It advised Economic Stabilizer Vinson, when he held that position, that the cost of the WLB awards would run somewhere between $80,000,000 and $110,000,000, when he was considering the approval of the so-called fringe awards.

After preliminary approving more generous price increases sometime in March, it decided to change its administrative standards or method of considering the losses companies were already sustaining on semi-finished products and other carbon steel products, it disapproved the preliminary increases.

LABOR SECRETARY: *Judge Lewis B. Swellenbach was appointed last week by President Truman to the cabinet post succeeding former Secretary Frances Perkins, who was the first woman to hold a cabinet post.*

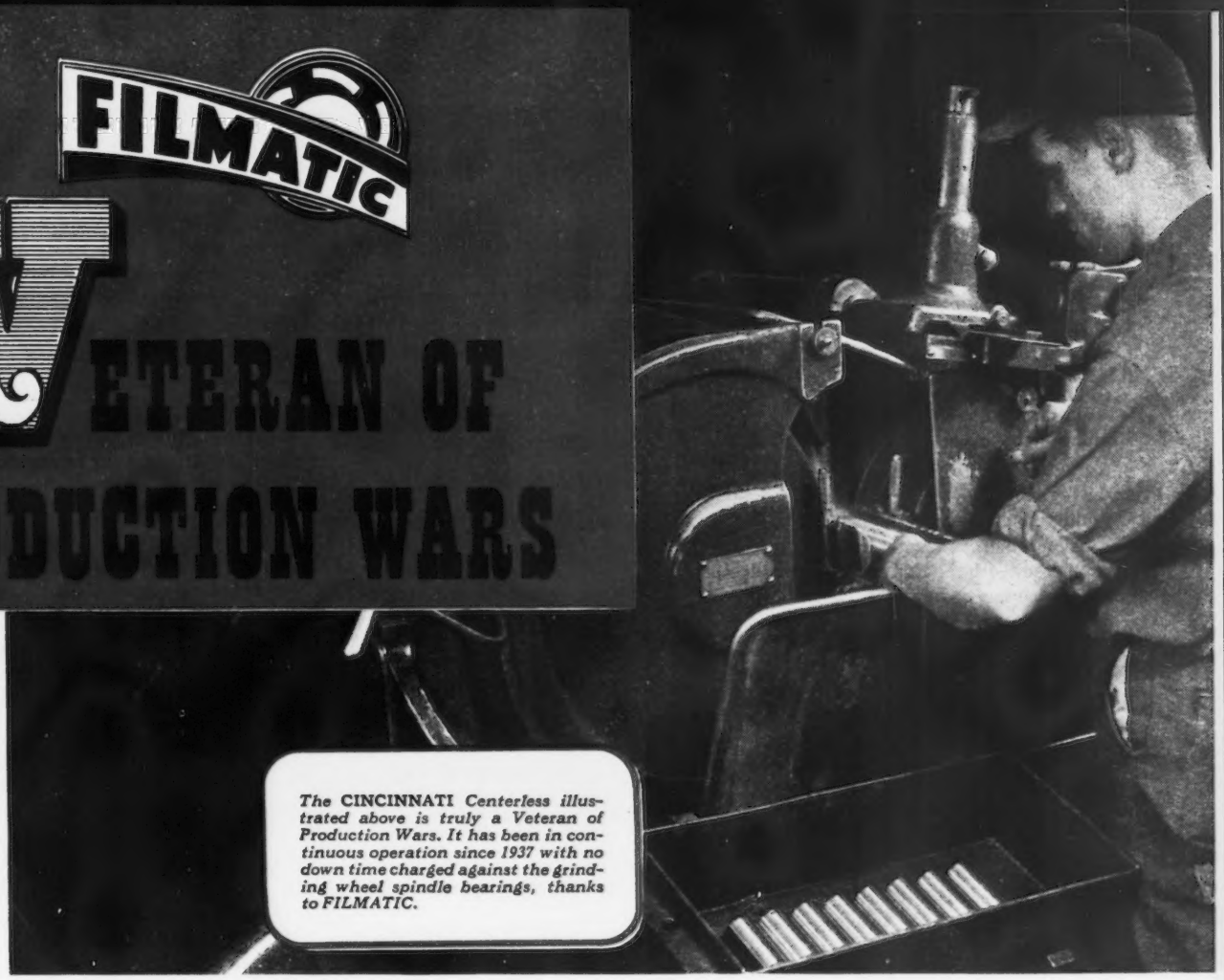
Thereafter, OPA began to ask itself and the steel industry all sorts of peculiar questions such as "What is a product?" "Is a plate a product before or after it is sheared?" "Do five or six semi-finished items constitute a single product?" "Can a company sustain out-of-pocket losses in making a carbon steel product when it is making money in its cement companies, or on its railroad?"

Although it is not set forth in the statement of considerations on the new prices, OPA has indicated that it thinks that the steel industry's wage bill will be less when the industry goes on a 40 hr. week and that industry earnings are bound to be diminished as war demands for steel recede.

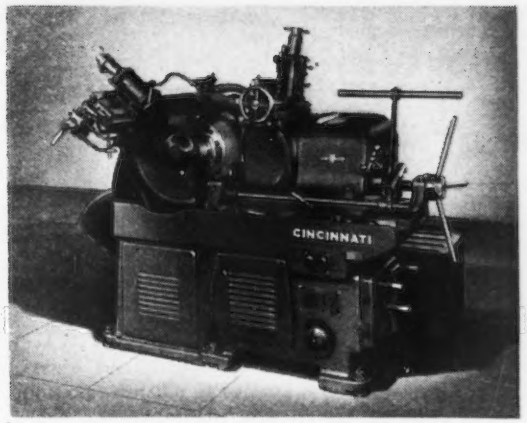
Yet OPA says that a study will be

FILMATIC

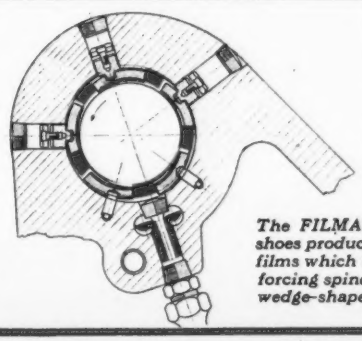
VETERAN OF PRODUCTION WARS



The CINCINNATI *Centerless illustrated above is truly a Veteran of Production Wars. It has been in continuous operation since 1937 with no down time charged against the grinding wheel spindle bearings, thanks to FILMATIC.*



CINCINNATI *No. 2 Centerless Grinding Machine. Catalog G-456-2 contains complete specifications. A brief description of all* CINCINNATI *Grinders may be found in Sweet's Catalog File for Mechanical Industries.*



The FILMATIC principle. Self-adjusting shoes produce independent, converging oil films which develop high radial pressures, forcing spindle into central position. "The wedge-shaped oil film does the trick."

CINCINNATI Grinding Machines built several years ago are still producing at a rate equal to or greater than the original estimate, with no down time or expense due to grinding wheel spindle bearing failure. One major reason for this exceptional performance is FILMATIC Spindle Bearings. Exclusive in CINCINNATI Grinding Machines, they give you these important advantages:

1) No seizure. 2) No breakdown. 3) Eliminates spindle flutter under all operating conditions. 4) No adjusting when changing from roughing to finishing cuts. 5) Greater accuracy over longer periods of time. 6) Less wheel truing. 7) Metal removal increased as much as 30% over machines with conventional bearings.

And while FILMATIC Bearings are only one feature, they are reason enough for you to choose CINCINNATI Grinders for your centertype or centerless work. Write for booklet G-446 containing complete details about this unusual spindle bearing.

CINCINNATI

CINCINNATI GRINDERS INCORPORATED CINCINNATI, 9 OHIO, U.S.A.

CENTERTYPE GRINDING MACHINES — CENTERLESS GRINDING MACHINES — CENTERLESS LAPPING MACHINES

undertaken by it to ascertain what compensatory decreases may be made in the prices of other steel products. At the same time it inconsistently comments that since the earnings of the industry as a whole are satisfactory, and since no over-all increase in prices is required, an effort will be made to determine the extent to which the increases required by the product standard may be compensated by reductions in other steel prices.

OPA officials know because they have said they know that the steel industry is losing money on many carbon steel products, making more money on others and making profits on subsidiary lines of fabrication. However, in judging what should be charged for steel, OPA has considered the profits made by companies which would show no profit at all if they were not in the manufacturing business, hardly related at all to the manufacture and marketing of steel products.

Holding the line and distorting the line are two different operations. It is hardly fair to penalize one company price-wise because it does not build ships or build pre-fabricated houses because another company does this and makes profits as a result.

One publicity-shy OPA official who thinks OPA price increases are niggardly said that if the price agency wants to put the little steel company permanently out of business, to the advantage of larger companies, all it has to do is to continue its present adamant stand. It may be added, too, that because of competitive conditions confronting them the small steel companies are not satisfied with a reported offer to OPA to grant them emergency prices that would be higher than established levels for the larger producers. The desire is for a uniform scale of prices.

Surplus Sales to Be Coordinated Using All Agency Reports

Washington

• • • **Designed to coordinate** their activities with those of the Surplus Property Board, all government agencies have been ordered by the board to file on or before June 30 a general description of their disposal programs and complete statistical data on all property disposal made under statutes other than the Surplus Property Act during the calendar years 1942, 1943 and 1944.

The order was issued under the Surplus Act of 1944 which provides that the act shall not impair or affect any authority for the disposition of property under any other law except that the board may prescribe regulations to govern any disposition of surplus property whenever it deems such action necessary to effectuate the policies of the Surplus Property Act.

SPB's order further requires each agency to supply a general description of all disposal programs at present contemplated under any statutes other than the Surplus Property Act. In furnishing the reports, the agencies are to break down their lists of disposals by statutes, indicating which statutes govern each disposal made.

Reconversion Heads Appointed for 400 Various Industries

Washington

• • • **In line with** WPB's plan to facilitate the change from war to peace production, appointment of reconversion chairmen for approximately 400 industries was announced on May 23 by the Committee on Period One—the time between victory in Europe and victory over Japan—headed by John D. Small, the board's chief of staff. The chairmen will advise and consult with their various industries on problems affecting machine tools, equipment, construction and materials for reconversion and should be consulted on all reconversion problems directly in Washington.

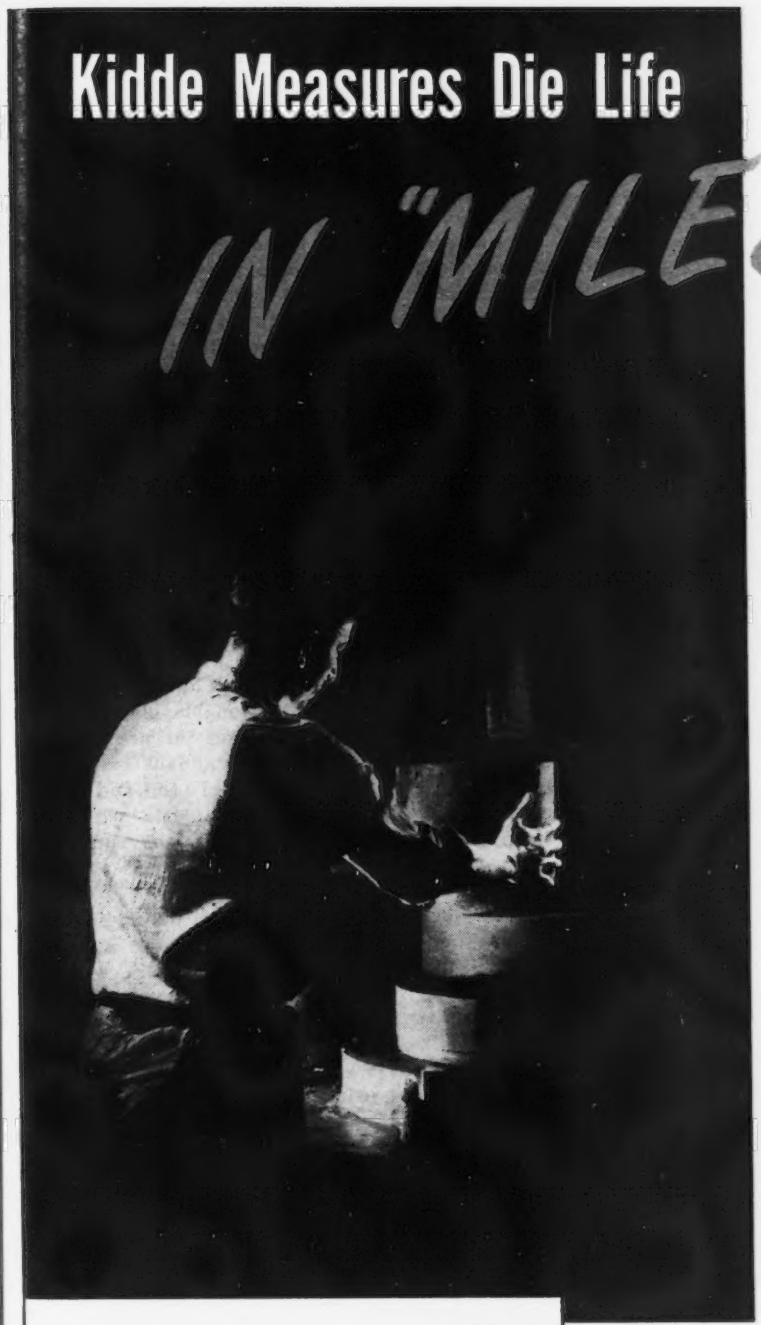
WPB officials cautioned that it is not within the agency's field of action to find the solution for all of industry's problems.

The industries are classified under 29 divisions. Among the divisions and their reconversion officers are the following:

Automotive, Valdo F. Wilson; building materials, C. P. Redick; construction machinery, R. C. Adams; consumers durable goods, F. M. Mitchell; containers, F. J. Detgen; farm machinery, Hugh M. Beshers; assistant, Harold Mills; general industrial equipment, F. B. Millham; mining, F. S. Miller; service equipment, Orval A. Slater; shipbuilding, A. E. Pierce; tools, A. N. Thomas; transportation, James M. Hennigan.

THE BULL OF THE WOODS BY J. R. WILLIAMS

Kidde Measures Die Life IN "MILES"... NOW



With the steadily increasing trend towards use of carbide dies for sheet metal drawing, the results obtained by Walter Kidde & Company, Inc., at their Belleville, N. J. plant—in the production of high pressure all-purpose gas cylinders and other deep drawn parts—are of particular interest at this time:

Operations: Cupping and deep drawing.

Type of Parts Drawn: Metal cylinders ranging in size from 2″ dia. x 6½″ long to 7″ dia. x 32″ long.

Metals Worked: SAE-4130 (chrome-moly) steel, and other alloy steels, mild steel, stainless steel, and aluminum.

Thickness of Metals: .050″ to .440″.

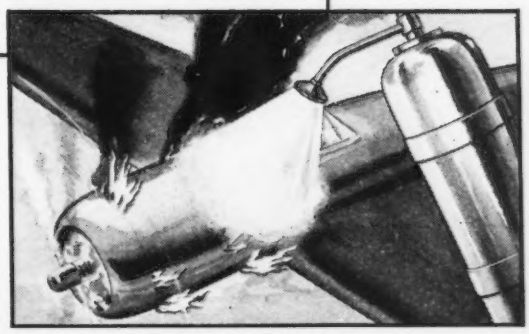
Size of Carboloy Dies Used: Ranging from 2″ I.D. through 13.6″ I.D. (Carboloy nibs used are among largest made to date, one weighing 105 pounds.)

Die Life: (a) Former steel dies—average 20,000 pieces total life; 2,500 pieces per repolish. (b) Carboloy Dies—250,000 pieces drawn to date on some dies and still running. In one case almost one half million feet have been drawn, with die wear of only .003″.

General Results with Carbides: Overall production increase of 25%-30%; 50% less press downtime for die changes; 50% reduction in scrap; greatly improved finish resulting in better quality and greater strength.

These outstanding results indicate the unusual possibilities in lower costs, better quality, and production increase available to plants through the use of Carboloy Dies for sheet metal drawing. Our engineers will be glad to furnish complete details on the use of Carboloy Dies for your drawing applications.

Increased die life—through use of carbide dies—enabled Walter Kidde & Company to increase output 30%. Die used on operation shown is one of largest Carboloy Dies ever made. The carbide-nib alone weighs 105 pounds.



Used on all passes from cupping to final draw, carbide dies draw 95% of all cylinders made by Kidde.

Die life is important at Kidde—to help speed production of high pressure gas cylinders for fighting fire on everything from bombers to battleships.

CEMENTED CARBIDES

CARBOLOY

TRADEMARK

SHEET METAL DRAWING DIES

CARBOLOY COMPANY, INC.

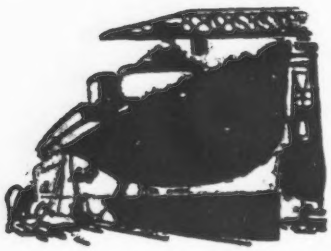
11153 E. 8 Mile Ave., Detroit 32, Michigan

Chicago • Cleveland • Detroit • Houston • Los Angeles • Milwaukee
Newark • Philadelphia • Pittsburgh • Thomaston, Conn.

West Coast . . .

OSGOOD MURDOCK

• Sand Committee develops standard sand use practice for California foundries and continues search for substitute Ottawa sand . . . Henry Kaiser satisfied with RFC financial adjustment of Fantana.



SAN FRANCISCO — Two years' work toward developing a standard sand use practice for California foundries will be released next week by the Sand Committee of the Northern California Foundrymen's Institute.

With a salute that will prove nostalgic to old-timers in the business, the committee acknowledges its debt to Joe Silverfoote, an early California molder, with a dedication which may elevate him to the plane of a Paul Bunyan or Febold Feboldson for the foundry industry. With a son now engaged in the business, the late Silverfoote is believed to be one of the earliest members of the craft to reduce his mixes to writing and make them available to fellow-workers.

Cooperation among the members of this organization has made it outstanding in the industry. Monthly meetings of the entire group inspect one another's plants and sub-committees at frequent intervals do likewise, with a free and open interchange of what elsewhere would be considered trade secrets. Only occasionally, according to members, does one of the group "take advantage of the situation and do a little checking up on what business the other fellow is running and requires slapping down."

In addition to Mr. Silverfoote's early formulas, the committee reports refinements of the mixes reported in last year's sand book.

Continued controlled experimentation work has narrowed down several optional variations in practice.

Among the new recommendations is the reminder that in facing mixes the course heaps (basically No. 440 sand) are undergoing daily changes in strength, moisture, silica content, fines and pitch build-up, which therefore require repeated check-ups to determine the extent of the deficiency or build-up in order to maintain a workable balance. This may be controlled by careful regulation of the moisture. One member increased the green compression strength of all green sand in facing mixes with results which justified the use of a more than usual quantity of bentonite.

The committee has found little success with sea coal, although one grade anthracite has furnished good results. Their experience with gilsonite has been satisfactory when used in a ratio of 1 to 30 on medium and light weight jobs, although heaps acquire a build-up or overflow evident at three to four-month intervals. When this condition is realized, it has been found wise to reduce the gilsonite ratio to 1 to 60 until the overflow is consumed.

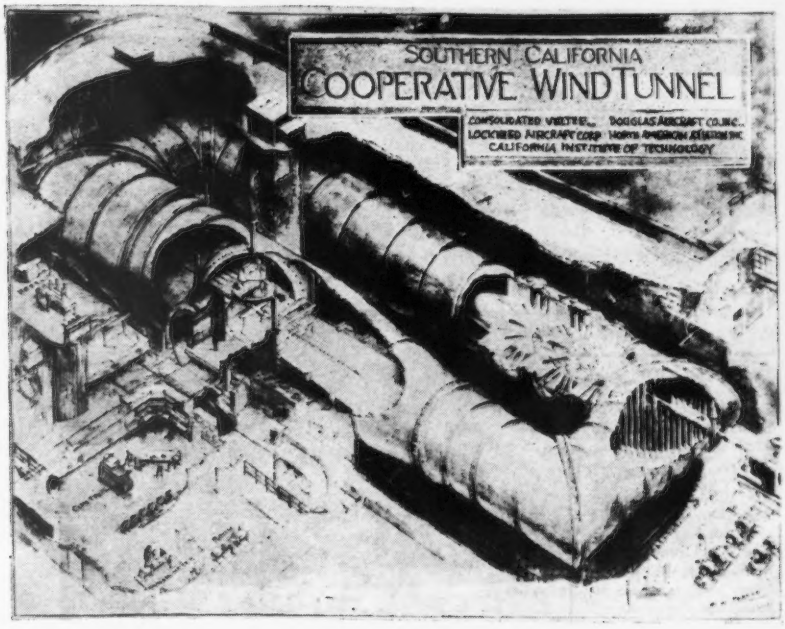
The committee has found a trend away from semi-synthetic practice due to lack of definite knowledge regarding the quantity and quality of silica. It is suggested that members take a leaf from the steel men's notebook and investigate the merits of 85 per cent and 95 per cent silica sand.

Considerable improvement has been found in the products of blacking manufacturers which may permit abandonment of the use of molasses or other bonding material, although this conclusion is not yet unanimous. Where molasses is used, it is recommended that wooden tanks be avoided to guard against bacteria which produce fermentation and sourness.

For a dependable clay wash the committee advises the use of 25 gal. of water—not stagnant or dirty—in a 50 gal. barrel. To this add 12 qt. of western bentonite; mix with power mixer, and with mixer running fill barrel with San Francisco molding sand.

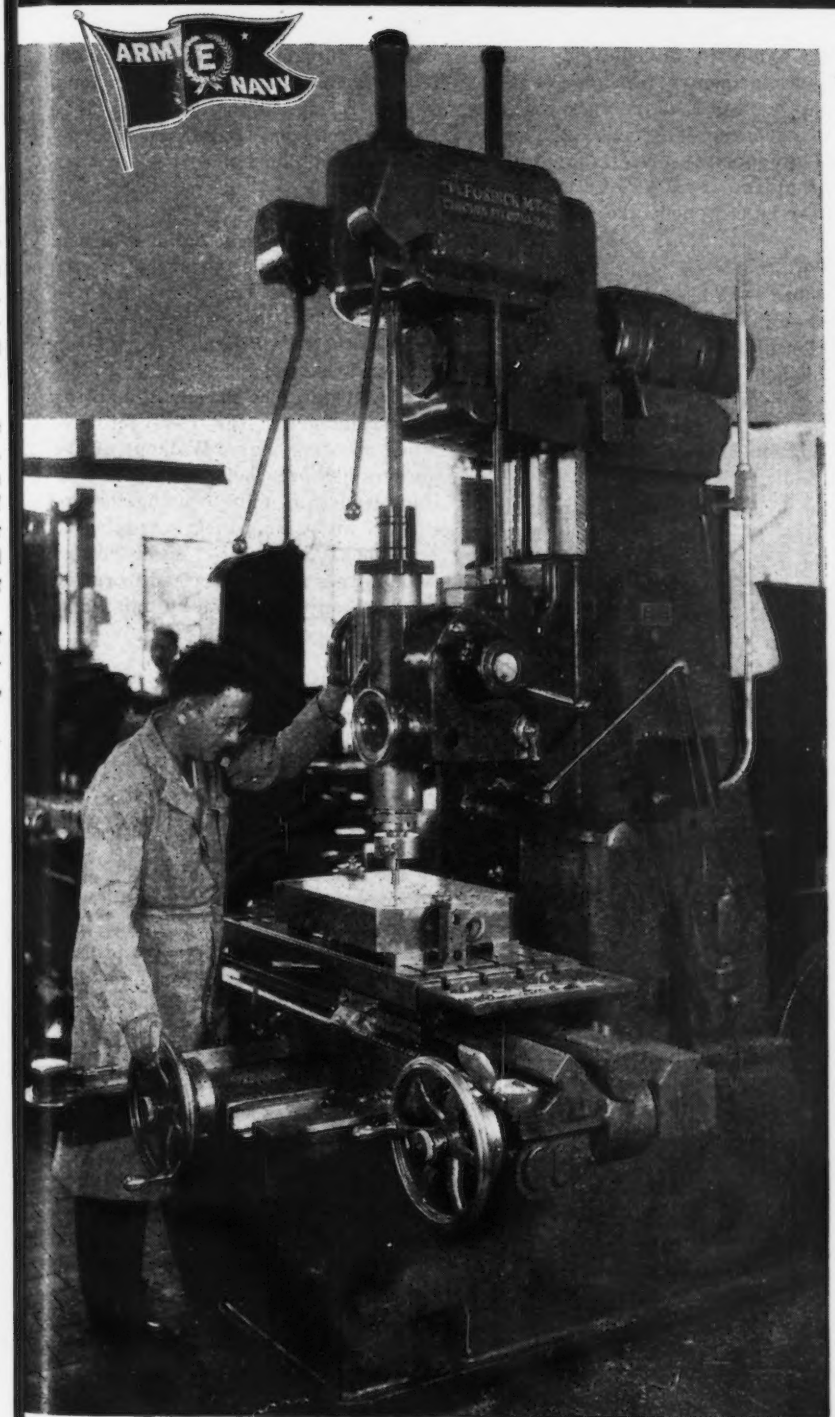
One other significant finding, after weighing the advantages and disadvantages of alternatives, was that,

WIND TUNNEL: *The general layout of the new cooperative wind tunnel built at Pasadena, Calif., for airplane tests is shown in this cutaway drawing. The decompression sphere, which can be closed off from the rest of the tunnel, is in the left center. The two power units, one* 10,000 *hp. and one* 2000 *hp. are in the lower right. Each* 16 *blast fan unit, center right, can be operated separately or in tandem through coupling. The control room is on a mezzanine, left, above the second floor.*



FOSDICK JIG BORER

for close tolerance die and tool work



● The Fosdick Jig Borer is specifically designed to handle close tolerance boring operations. For this reason it is used extensively in tool rooms and tool and die shops. However, its versatility in handling production jobs in quantities too small to warrant an investment in jigs or fixtures has made it very popular with many shops producing war material.

Here it is shown on a precision boring operation in a tool and die shop. Operation is simple. All controls are centralized for operating convenience. Twelve speeds in geometrical progression from 60 to 1500 RPM are instantly obtained thru a single lever. Nine feeds from .00125 inch to .010 inch are available thru a single control lever with direct reading index.

The Fosdick Jig Borer offers all the advantages of high priced precision machines at a comparatively low cost. It is ideal for precision drilling—boring—facing or even light milling operations. For speed—accuracy—low cost—put your precision jobs on a Fosdick Jig Borer.

A full description bulletin is available—ask for Fosdick Jig Borer Bulletin J.B.I.

FOSDICK MACHINE TOOL COMPANY
CINCINNATI 23, ··· OHIO

with adequate sand control, synthetic facings were cheaper and more efficient than any other type.

The committee's report is available at the Northern California Foundrymen's Institute, Rialto Bldg., San Francisco, of which Ralph Noah is president, and George Kennard, secretary.

Other current developments on the sand front in the West include continued search for a substitute for Ottawa sand in other directions. The Pacific Northwest is meeting with success with the recently developed Eugene, Ore., sand of the Oregon Silica Products Co., but as yet this group has not been able to persuade California foundrymen to change their heats to accommodate the difference in quality.

A new group is understood to be trying to raise money in Washington to exploit a deposit located at Overton near Lake Mead, Nev. While Pittsburgh sand continues to serve the Bay area, and to relieve the railroad congestion, those familiar with the Midway, Nev., sand feel that it may be superior in chemical analysis and grain shape. Although the Eugene sand is being offered at $9.25 in the Bay region, any quality superior to the Eugene or comparable to Ottawa would bring the district the benefit of a $3.80 freight rate from Nevada.

* * *

HENRY KAISER announced last week that "satisfactory" terms are granted by RFC in adjustment of his indebtedness in connection with the original construction of the Fontana plant. He can obtain from certain California banks private loans of $52,000,000 to provide facilities for making tin plate, light sheet metal for miscellaneous manufacturing producers, a pipe mill and other improvements essential to reduced costs of operation not possible to obtain when the original plant was erected. Kaiser projects have been extensively financed by the Bank of America, and this state-wide organization is presumed to have tentatively assumed the additional undertaking.

Some months ago responsible officials of RFC at Washington are understood to have indicated their unwillingness to reduce the original note on the Fontana plant because the original plan for financing permitted payments from shipbuilding operations independent of renegotiation or income tax payments. This latest comment by Mr. Kaiser and the submission of the issue at this time immediately followed dispatch of a letter simultaneously addressed to John Snyder, administrator of the Federal Loan Agency, and Sam Husbands, director of the Reconstruction Finance Corp. at Washington, of which Congressman Harry R. Sheppard of Yucaipa, Calif., was author and which was signed by 23 members of California's congressional delegation. This letter requested an equitable financing arrangement with the present operators to keep Fontana operating and to provide the West with additional steel products at prices that will be less than the so-called differential and thereby be of benefit and value to the West.

"We appreciate that an ultimate alternate would be possible foreclosure by RFC and sale or other disposition of Fontana property to some established steel company. The time alone involved in such procedure would require many, many months during which facilities would be entirely idle."

The delegation reported its understanding that earnings from Kaiser shipyards with accruals to date which can be applied on RFC loan payments approximate $27,000,000. Including remaining work, the total will approach $40,000,000. Ship earnings paid to RFC to date total approximately $8,600,000 and approximately $8,700,000 in interest has been paid.

* * *

War Manpower Commissioner Paul McNutt, after a series of meetings during a three-day visit to the Bay area, left as quietly as he arrived with only three local developments to mark his visitation.

Columbia Steel's $6,000,000 foundry at Pittsburgh is to close down with all employees absorbed into the plant's own foundry and mill. Simultaneously the Mare Island yard, part of the Navy's $513,000,000 investment in the Bay area, is scheduled to go on three shifts as Admiral C. W. Fisher reports that the yard has 15 per cent more repair work than it can handle.

In southern California, Commissioner McNutt removed the area from a No. 1 bracket into No. 2 class and the area immediately petitioned for a No. 3 rating. San Francisco is a No. 2 area and Puget Sound continues in the No. 1 most critical category.

* * *

In the largest strike ballot ever held by NWLB, 31,000 members of the AFL Machinists Union at Lockheed Aircraft Corp. last week voted two to one their willingness to go on strike. Lockheed is currently producing seven different models of fighting planes, including the P-80 jet propelled shooting star. Walkout of the workers has been held in abeyance by union leaders pending hearings before a WLB airframe panel, scheduled to start soon. Meanwhile, eight groups of employees are being asked to ratify items already agreed on by union and company negotiators.

* * *

CORRECTION—In the April 9 issue of THE IRON AGE it was stated that the Yuba Mfg. Co., San Francisco has taken over from Watervliet Arsenal in New York the machining and rifling of the tubes and manufacturing the breech ring and blocks for the 155 mm. howitzer and that it was the sole supplier. This statement was incorrect as the arsenal still has this basic weapon in production and has made many of them throughout the war.

Cited for Awards

• • • **The following companies** have received Army-Navy "E" awards for outstanding war production:

Monroe Auto Equipment Co, Monroe, Mich. (fourth star)
Westinghouse Lamp Divisions at Bloomfield, Belleville, Trenton, N. J., and Fairmont, W. Va. (first star)
Clearbrook Woolen Co., Clearbrook, Va.
Commercial Equipment Co., Kansas City.
Dayton Rubber Mfg. Co., Thorobred Textile Division, Waynesville, N. C.
Hercules Body Co., Inc., Evansville, Ind.
Induction Heating Co., New York.
Miniature Tool Co., Clawson, Mich.
Modern Steel Equipment Co., Geneva, Ill.
S. E. Overton Co., South Haven, Mich.
Simmons Co., San Francisco.
Superior Foundry Co., Cleveland.

Superfort Tries Out Big In-Line Engines

Cleveland

• • • **Cleveland has made** a new contribution to the Army Air Forces lengthening agenda of super bombers, the "XB-39"—a B-29 equipped with in-line liquid-cooled engines.

Modification work on the standard model was performed at Fisher Aircraft Plant No. 2, and the new ship is essentially the same as a B-29 with the exception of engine mountings. Installation of the Allison V-3420 engines to create the XB-39 was given to the Fisher plant because of experience in this work gained through modification of the B-19, now known as the XB-19A.

Teamed with ARMCO Low-Alloy High Strength Steels these stiffeners (and many variations of their basic design) help engineers create lighter, stronger structures. They cut "dead-weight" and increase efficiency of transportation equipment and other products as well.

Through the use of stiffeners and other improved designs, the sheet steel shell of the product now bears an ever-increasing part of the total load. This is made possible by steels like ARMCO 50Y and 55Y — with minimum yield strengths of 50 and 55 thousand psi. respectively. Designers can increase the load the members will stand or use lighter gages with the same loads.

For some uses, lighter-than-conventional gages can be employed without reinforcement of any kind. This helps save steel and cuts costs.

Besides these advantages, ARMCO Low-Alloy High Strength Steels are easily fabricated and have excellent welding properties. Corrosion resistance of ARMCO 50Y and 55Y is considerably greater than that of ordinary steel. Where extra rust resistance is needed, zinc or aluminum coatings can be applied.

Write us for complete data on ARMCO Low-Alloy High Strength Steels. It may help you design your new or improved peacetime products with less weight and greater efficiency. The American Rolling Mill Company, 621 Curtis Street, Middletown, Ohio.

EXPORT: THE ARMCO INTERNATIONAL CORPORATION

THE AMERICAN ROLLING MILL COMPANY

ARMCO HIGH STRENGTH STEELS

PERSONALS

FRANK C. HASSE, vice-president, Mechanical Department, The Oxweld Railroad Service Co.

• **Frank C. Hasse** has been elected vice-president of the Mechanical Department, The Oxweld Railroad Service Co., a unit of Union Carbide & Carbon Corp., New York. Mr. Hasse joined the company in 1913, and has subsequently been made superintendent of construction and maintenance and general manager.

• **Lawrence C. Miller,** formerly assistant treasurer of the Vanadium Corp. of America, New York, has been elected treasurer of the corporation. **John W. Lohnes,** formerly assistant general manager of sales has been appointed Chicago district sales manager, succeeding the late Le Roy F. Johnson.

• **Frank W. Godsey, Jr.,** has been appointed manager of the New Products Division, Westinghouse Electric Corp., Pittsburgh. Mr. Godsey replaces **G. H. Woodard,** who has been transferred to South Philadelphia as manager of the corporation's Aviation Gas Turbine Division.

• **Norris Boehmer** and **Clarence Barbre,** formerly operating superintendents, each have been advanced to the rank of manufacturing superintendent at Monsanto Chemical Co.'s plant, Monsanto, Ill..

• **J. C. Hamilton** has been named service engineer for Quimby pumps and Fort Pitt steel castings in Chicago and surrounding territories, H. K. Porter, Inc., Pittsburgh.

o o o

• **Francis E. Fairman, Jr.,** has been named a vice-president of Food Machinery Corp., San José, Calif., and manager of the Peerless Division. Mr. Fairman had been assistant manager of the General Electric Co.'s Switchgear Division before joining Food Machinery.

• **John C. Dopke,** for several years assistant automotive sales manager, A. O. Smith Corp., Milwaukee, has become sales manager of the division; **Urban T. Kuechle** and **Milton E. Morgan** have been named assistant sales managers under Mr. Dopke and **Ernest A. Barlow** has assumed the newly created post of manager of the order department.

CHARLES P. CUTLER, district manager of Chicago operations, Republic Steel Corp.

• **Charles P. Cutler,** formerly assistant district manager, has been named district manager of the Chicago operations, Republic Steel Corp., Cleveland, succeeding **Mowry E. Goetz,** who has been appointed vice-president in charge of operations. **P. M. Murphy** succeeds Mr. Cutler as assistant district manager.

• **George N. Powell** has been appointed purchasing agent of Dravo Corp., Pittsburgh, succeeding **Anthony Davia,** who has relinquished his duties to accept a new assignment in the company.

• **James H. Gregg** has been appointed assistant to the vice-president of Reynolds Wire Co., Dixon, Ill. Mr. Gregg was formerly president of the Gregg Mfg. Co., Ltd., of Winnipeg, Canada. **M. E. Haas** has become general manager of sales.

• **Glenn S. Cashdollar,** previously resident manager of the Grand Rapids Stamping Division, Fisher Body Division of General Motors Corp., has been appointed assistant general factory manager of all Fisher Body fabricating plants, with headquarters at Detroit. **F. B. Harrington** succeeds Mr. Cashdollar as manager of the Grand Rapids Stamping Division, and **Anthony Stormzand** has become assistant resident manager of the division.

• **John J. Dougherty** has been elected to the board of directors, Jessop Steel Co., Washington, Pa.

• **Frank H. Mulligan,** connected with Charles Hardy, Inc., New York City, for 26 years, has been elected a vice-president of the company. Mr. Mulligan will also retain the title of general sales manager.

• **Gordon S. Gillespie** has been appointed comptroller and secretary of Adel Precision Products Corp., Burbank, Calif. For the past seven years Mr. Gillespie has been secretary-treasurer of Diamond Iron Works, Inc., and Mahr Mfg. Division, Minneapolis.

GORDON S. GILLESPIE, comptroller and secretary, Adel Precision Products Corp.

J. K. BEESON, executive vice-president, Pittsburgh Steel Co.

• **Lt. Col. John K. Beeson,** who recently completed his duties with the U. S. Strategic Air Forces in Europe, has been elected executive vice-president of the Pittsburgh Steel Co., Pittsburgh. Prior to his enlistment in the Air Corps three years ago, Colonel Beeson was vice-president in charge of sales for the company.

• **Joseph H. Hayden** has been named vice-president and **William H. Watkins,** controller and assistant treasurer of the Hewitt Rubber Corp, Buffalo, N. Y.

• **Samuel S. Williams,** president of the Bradford Machine Tool Co., Cincinnati, has retired after 44 years with the company. Mr. Williams will continue on the board of directors. **J. R. Stewart** has been named to succeed Mr. Williams, and **Robert P. Jones** and **Charles J. Smith** have been appointed vice-president and secretary-treasurer, respectively.

• **Henry A. Roemer, James H. Dunbar, Henry A. Roemer, Jr., C. H. Hobbs** and **Ernest Keys** have been elected board chairman, president, executive vice-president, sales vice-president and general manager, respectively, of the Detroit Seamless Steel Tubes Co. We regreat that in the May 24 issue THE IRON AGE incorrectly stated that the above men were elected officers of Sharon Steel Corp. The executive staff at Sharon remains unchanged.

• **G. H. Lineberry** has been appointed apparatus and supply manager for the Pittsburgh district, Westinghouse Electric Supply Co., New York, and **Albert L. Wiegenstein,** apparatus and supply manager for the North Pacific district. **Charles R. Lee** has been appointed manager of the New Orleans branch; **C. M. Reynolds,** manager of the Corpus Christi branch, and **L. J. Clay,** manager of the San Antonio branch.

• **James C. Patton, Jr.,** formerly sales engineer in Detroit for Heppenstall Co., Pittsburgh, has been placed in charge of the company's Chicago sales office.

• **Raymond E. Birch** has been named director of research for the Harbison-Walker Refractories Co., Pittsburgh, to succeed the late Fred A. Harvey.

• **A. M. Andrews** has joined the staff of the Briggs Clarifier Co., Washington, D. C., as one of the chief service engineers for the Aviation Division.

• **Edward E. Brown** has been elected a director of the Cleveland-Cliffs Iron Co., Cleveland.

• **W. H. Ross** has been appointed district manager of Michigan and northern Ohio territory, The Udylite Corp., Detroit.

• **Capt. George G. Hathaway** has joined Giebel, Inc., New York, as sales engineer.

• **Stanley G. Disque** has been appointed engineering service representative for the state of Indiana for Sterling Alloys, Inc., Woburn, Mass.

• **J. C. Schaefer,** formerly Pittsburgh district office field engineer for Allis-Chalmers Mfg. Co., Milwaukee, has been appointed branch office manager at Youngstown, Ohio, succeeding **E. H. Legler,** who has been transferred to the electrical department at Milwaukee.

• **Fred Brown,** formerly New England sales engineer for the Copperweld Steel Co., has been transferred to the home office at Glassport, Pa., where he will assume the duties of staff engineer in the general sales department. **H. M. MacDougal** has succeeded Mr. Brown in the New England territory.

ROY CRAWSHAW, manager of engineering and sales, Western Gear Works

• **Roy Crawshaw** has been named manager of engineering and sales, Western Gear Works, Seattle, and **W. A. Witham,** assistant manager of engineering. **P. L. Bannan** has been appointed manager of manufacturing for all plants, with **G. A. DeArmand** his assistant.

• **H. A. Schimberg** has been appointed director of purchases of LaPlant-Choate Mfg. Co., Inc., Cedar Rapids, Iowa.

OBITUARY...

• **Edwin R. Fellows,** founder and president of the Fellows Gear Shaper Co., Springfield, Vt., died May 22 at the age of 80.

• **Willard L. Cumings,** geologist for Bethlehem Steel Co., Bethlehem, Pa., since 1906, died May 15 at the age of 71.

• **Joseph T. Blakemore,** 59, chief chemist for Sloss-Sheffield Steel & Iron Co., Birmingham, Ala., died May 14.

• **Emil C. Traner,** 68, who retired last November as president and general manager of Rockford Clutch Division, Borg-Warner Corp., Chicago, and who still was supervisory board chairman of the division, died May 7.

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For as little as 500 Pounds for as much as 60 TONS . . .

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do the job Better, Quicker, and SAVE YOU MONEY!

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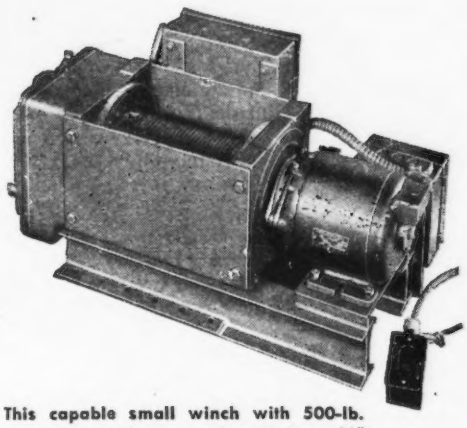
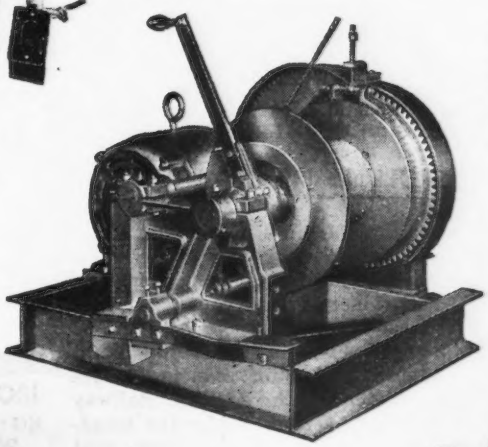
R & M electric winches fit every service need. Types include both spur-gear and worm-gear models, push-button and drum control, automatic and manual load brakes. Many have anti-friction bearings throughout. All have enclosed ball-bearing motors and impact-resisting welded steel bases. Let us show you how R & M electric winches *speed* handling, *cut* maintenance, *save* money.

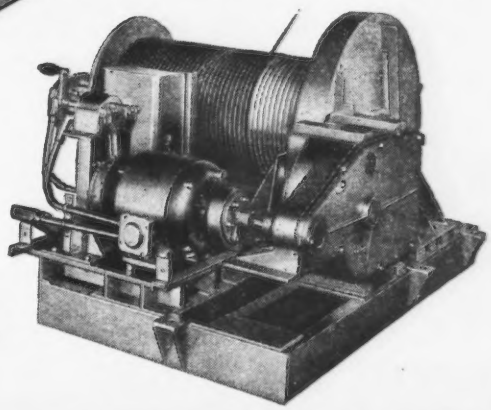


This capable small winch with 500-lb. rope pull at 60 f.p.m. takes 75 ft. of ¼" cable without over-winding. Enclosed heat-treated spur gears and shafts operate in oil bath on Hyatt bearings. 1¼ H.P. motor. Type S½K.



Electric Friction Clutch Winch with 5 H.P. or 10 H.P. motor for 1000- or 2000-lb. rope pull at 120 f.p.m. Capacity: 740' of ⅜" cable; 700' of ½". Cut tooth gears are nickel alloy; pinions, steel. Clutch cam has ball thrust bearing. Powerful foot brake and steel pawl. Formed asbestos friction. Type CB.

For loads up to 60 tons. Primary spur gear reductions are oil-bath-lubricated nickel alloy steel with pinion integrally cut on shaft. Rope speed and drum capacity as required. Drum controlled. Extra sturdy base. Type S5WX.



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Dallas . . . . . 1100 Cadiz St.	Philadelphia . . . . 401 N. Broad St.
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Detroit . . . 7376 Grand River Ave.	Providence . . . . . 44 Clifford St.
Houston . . . . 3715 Harrisburg Blvd.	San Francisco, 116 New Montgomery St.
Jacksonville . . . . . 45 Forsyth St.	Seattle . . . . . 216 Walker Bldg.
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Dear Editor:

PRECISION CASTING

Sir:

I would appreciate information on the lost wax method of casting metals. This process involves the use of a wax model which is melted out after the mold is made. The cavity is then filled with steel or other metal. The wax models are being produced on injection molding machines and so I would be interested in any data on the process. I understand that other materials are also being used instead of wax, such as certain thermoplastics which melt at reasonable temperatures.

VICTOR ROSENLUND, JR., Sales Engineer
Reed-Prentice Corp., Worcester 4, Mass.

● A picture of a typical small wax injection molding machine that is in wide use today in the precision casting field is shown in a reprint containing seven articles on this subject that have appeared in The Iron Age recently. We have been informed of several manufacturers using polystyrene for this purpose. It has the advantage of being reduced to powder form when subjected to high heat but requires a full scale injection molding machine for its application. The wax injection molder on the other hand is a small bench type machine that sells for only a few hundred dollars.—Ed.

WELDED PIPE MACHINERY

Sir:

It will help us to be placed in contact with manufacturers of machinery for electric conduit pipe to British standards, electric resistance welding plant, etc.

G. G. NEACE
National Cycle Mfg. Co., Ltd., Kashmere Gate, Delhi, India

● The names of several manufacturers are on the way.—Ed.

INGOT MOLDS

Sir:

We are gathering some literature for our London office on ingot molds and their manufacture. May we have tear sheets of the following articles: "Why Ingot Molds Have Short Life," Feb. 21, 1929, "Chemical Compositions of Ingot Molds Need Thorough Revision," Aug. 13, 1931.

DAVID J. JOSEPH, JR., President
David J. Joseph Co., Cincinnati 2

● Sorry but these issues are exhausted. However the Cincinnati Public Library keeps bound copies and you can have these articles photostated at small cost.—Ed.

LEND-LEASE

Sir:

In the *Washington Post* of April 25 an editorial makes mention of your survey among companies in the metal producing and metal working fields, 39 per cent of which reported that inquiries about their products had resulted from the lend-lease of Army and Navy equipment in use overseas. This was mentioned by Oscar Cox, deputy administrator of the FEA, in testimony before a Senate subcommittee. We should like to obtain a copy of the survey.

LILLIAN SPECTOR, Manager, General Operations Dept.
International Training Administration, Inc., 734 15 St., N.W., Washington 5, D. C.

● We are sending you tear sheets of the article "Export," by S. H. Barmasel in the Jan. 4 issue.—Ed.

METALLIC SPRAY

Sir:

In the issue of Feb. 6, 1941, there was a description of the use of the Schori process of metal spraying. We have been unable to find the name of the manufacturer or agent handling this equipment and will be pleased to have your assistance in locating the producer.

GEORGE A. PUGH, Consulting Engineer
18 North Phelps St., Youngstown 3, Ohio

● This process is controlled by the Schori Process Corp., 8-11 43rd Rd., Long Island City 1, New York.—Ed.

ENEMY PATENTS

Sir:

Some time ago THE IRON AGE carried listings of seized enemy patents available on license from the Alien Property Custodian. Are reprints available?

FRANK GARRATT, Vice-President & Technical Director
Universal Cyclops Steel Corp., Bridgeville, Pa.

● Our list of seized patents is available at 30c. per copy.—Ed.

REROLLING MILL WANTED

Sir:

As the war in Europe and Japan seems to be drawing to a successful conclusion the restrictions on importing machinery from America to South Africa will no doubt soon be lifted. I am eager to start a small rolling plant in South Africa for reducing or rerolling old South African Railway lines, 60 lb. per yd., to fencing standards. If you know of any firms that manufacture this type of mill, will you kindly ask them to communicate with me?

J. C. RENNIE
13 Craddock Ave., Rosebank, Johannesburg, South Africa

GAEDE ROTARY PUMP

Sir:

In your issue of May 3, Archie Reid inquires about the Gaede rotary oil pump. This was manufactured in Germany and was fairly common in the physics laboratories twenty years or so ago. Mr. Reid could undoubtedly see such a pump at the University of Chicago or at Northwestern University. Vacuum Practice by L. Dunoyer, G. Bell & Sons, Ltd., 1926, mentions this pump as the first rotary oil pump and offers a good bibliography of pump literature.

R. A. SAWYER, Commander, USNR
U. S. Naval Proving Ground Dahlgren, Va.

● Thank you for this information which we shall be glad to relay to Mr. Reid.—Ed.

FOUNDRY EXPANSION

Sir:

I would like to make use of your service on matters of special information. I am particularly interested in the expansion of the foundry industry in the U. S. since 1941. Any information as to the degree of expansion and how it was financed will be greatly appreciated.

W. F. CLEVE KIDD, Research Director
United Steelworkers of America, Toronto, Ont.

● The best source of this information is the American Foundrymen's Association, 222 West Adams St., Chicago.—Ed.

SHOT PEENING

Sir:

Would it be possible for us to obtain two copies of the article on "Mechanical & Metallurgical Advantages of Shot Peening," by O. J. Horger of the Timken Roller Bearing Co.?

W. H. McCORMICK, Chief Metallurgist
Crucible Steel Co. of America, Park Works, Pittsburgh, Pa.

Sir:

Please send two reprints of article.

H. DAUPHANIS
Wallace Barnes Co., Bristol, Conn.

● Reprints of this two part article are available at 50c. per copy.—Ed.

MAGNESIUM WELDING

Sir:

We would appreciate receiving a copy of "Spot Welding of Magnesium Alloys" from the April 12 issue.

OSCAR BLOHM, Chief Metallurgist
Hills-McCanna Co., Chicago 18

● Tear sheets mailed.—Ed.

IRON POWDER

Sir:

We would appreciate three reprints of the article "Particle Size Analysis of Iron Powders," by Dr. Harold H. Steinour, from the May 17 issue.

RICHARD P. SEELIG, Chief Engineer
Powder Metallurgy Corp., Div. General Bronze Corp., Long Island City 1, N. Y.

● Tear sheets have been mailed.—Ed.

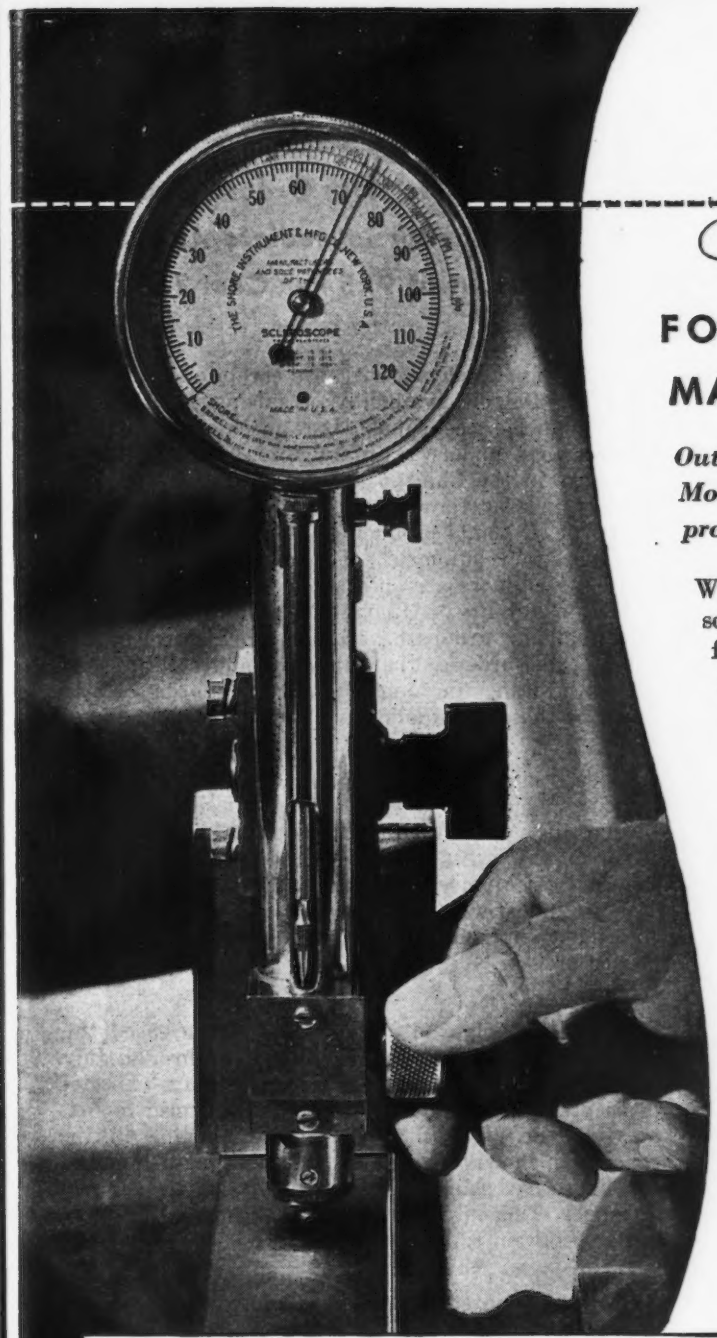
ELECTROLYTIC DESCALING

Sir:

Would you enable us to contact manufacturers of equipment used in the Bullard-Dunn Process of electrolytic descaling?

J. TIHAM
Thoma Engineering Works, Johannesburg, South Africa

● Your letter has been referred to the Bullard Co., Bridgeport, Conn.—Ed.



Formula

FOR LONG LIFE AND MAINTAINED ACCURACY

Outstanding performance of more than 18,000 Monarch Lathes with flame-hardened beds proves value of exclusive Monarch development.

With an average hardness of 70 on the Shore Scleroscope, Monarch flame-hardened lathe beds successfully minimize wear, discourage scratching and resist scoring. Even under severe wartime conditions, these lathes retain their brand-new accuracy —are good for many years of service.

Since 1937, we've built more than 18,000 Monarch Lathes with flame-hardened beds. If any of these have not stood up properly under normal use and shop conditions, we want to investigate and cure any dissatisfaction if the fault is ours.

On the other hand, we'd like favorable comments, too. Then we can pass the successful experience of Monarch users to other lathe purchasers, to help all of us obtain faster, more economical, more accurate production in the years ahead.

THE MONARCH MACHINE TOOL CO. · SIDNEY, OHIO

FACTORY BRANCHES:

622 West Washington Blvd.
Chicago 6, Ill.

635 Industrial Office Bldg., Newark 2, N. J.

801 Fisher Bldg., Detroit 2, Mich.

512 Empire Building
Pittsburgh 22, Pa.

10465 Carnegie Ave.
Cleveland 6, Ohio

38th and College Ave.
Indianapolis, Ind.

Representatives in principal cities.

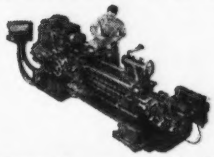
Engineers and Designers Wanted

Monarch maintains engineering and designing offices in Dayton and Sidney, Ohio, for which we need alert, experienced board men. WMC compliance required. Address us at Sidney, Ohio.

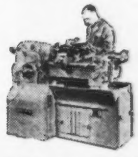
Monarch Saves Time

BETTER PRODUCTION FOR MORE YEARS WITH MONARCH LATHES

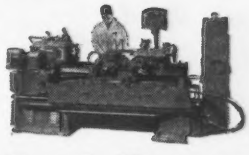
Monarch new 10" x 20" Sensitive Precision Toolmaker's Lathe.



Monarch new 10" Hi-Speed Precision Turning Machine.



Monarch improved Magnamatic Fully Automatic, All-electric Turning Machine.



Monarch Shapemaster Formturning Machine with electric controls.

This Industrial Week . .

- ***Cancellation Volume on the Upgrade With Orderly Procedure***
- ***Huge Sheet Carryovers Dim Hopes for Immediate Auto Steel***
- ***Ingot Rate Again Declines; Output at 91.5 Per Cent This Week***

CANCELLATIONS were progressing in the steel industry this past week in a gradual and orderly fashion, allowing steel producers to rearrange their schedules without too much confusion. The bulk of steel cancellations, as a result of military cutbacks, are still to come, however. One mill reports that about 25 per cent of the cancellations received during the past two weeks have been for armor plate and another 10 per cent for shell steel. The remainder affected orders calling for deliveries throughout the rest of this year.

The period of transition from a higher war production level to a lower one is expected to last longer than was thought a few weeks ago. Because of backlogs, however, there was little indication this week that the steel ingot rate would suffer much from the current level which is already a few points below ingot output earlier in the year. As fast as orders are taken off mill schedules, other orders involving war material or war supporting products are immediately substituted. Because of this situation there still continues to be plenty of room for argument as to the extent steel will be available for civilian purposes after July 1. That there will be some goes without saying, but there is apt to be at least in July and August a smaller amount than some consumers have been led to believe.

Sheet steel schedules this week are still tightly packed through the third quarter with CMP tonnage, a fact which is casting some shadow over the possibility that automobile makers may obtain much if any sheet tonnage before the last three months of this year. The carryover from May into June of undelivered sheet tonnage for which earlier delivery had been promised is estimated at around 300,000 tons—an amount sufficient to take care of the automobile industry's entire scheduled 1945 production.

Even though the steel industry this week was in no position to talk delivery promises on a concrete basis with automobile makers, this will not lessen the certainty of continued pressure for such assurances. While steel industry officials believe that the steel situation for customers other than the government and those industries supporting the war will become much easier before the year is out, this is merely an opinion and as such cannot be utilized to make firm delivery commitments.

ALREADY there is some belief among steel consumers that the heavy demand for non-rated uses will be so great that if it is adequately divided in the months immediately ahead, no single group will receive large quantities of steel. This possible outlook, according to some district reports, has caused steel consumers to be quite pessimistic concerning their ability to obtain a representative steel tonnage in the near future. Cancellations, however, if greatly accelerated over the next few month could, overnight, change this conservative attitude.

In the final analysis with the exception of such arsenals as Detroit, availability of labor may be the key, more than the steel supply, as to when civilian production can get underway in full force. Heavy contract cutbacks in the Chicago area for instance will result merely in transferal of labor from arms output of one type to plants producing other types of direct or indirect war equipment. Farm equipment and railroad car builders are showing concern over this particular possibility. Although the automotive industry and appliance groups have been rather active in placing unrated orders, other civilian manufacturers have shown hesitancy in doing likewise on a large scale because of the clouded labor availability picture.

The orderly flow of steel cancellations has expanded to a daily figure about 50 per cent greater than that which was current on VE-Day. As a consequence net steel orders are running from about two-thirds as great as shipments for most producers to about 100 per cent of shipments for certain heavily loaded mills. For the industry as a whole, May will probably be the first month in many in which total shipments have exceeded orders.

THE steel plate situation was further eased this past week with most mills filled only through July. Substantial holes in plate mill schedules are expected to be prevalent after that time. Unconfirmed reports mention the possibility of a large pipeline in the Orient which will require considerable plate tonnage, but like other plans of this nature it may never materialize. Talk in the trade also envisions a new container program to involve upwards of 350,000 tons of 3/16 in. plate.

Railroad maintenance and repair have been given an urgency rating comparable to that of direct war needs. Export rail inquiries are mounting with queries from French, Turkish and South American railroads. WPB has authorized construction of 48 passenger cars by Budd and 46 by American Car & Foundry using third quarter material. Budd will build 21 baggage and mail cars for Sante Fe and 27 cars for Atlantic Coastline. ACF will build 20 cars including coaches and diners for L and N, 20 baggage coaches for NYC and six various types for Wabash.

Authorization has been given American Car & Foundry to build 150 40-ton refrigerator cars for Cudahy Packing Co., 10 mill transfer cars for Carnegie-Illinois, and 150 70-ton hopper cars, of which 50 will go to Missouri Pacific, 25 to St. Louis Southwestern, 25 to Shippers Car Line and 50 to Texas and Pacific. Authorization has been given to Pressed Steel Car to construct 10 50-ton hopper cars for Midland Electric Coal Corp.

The national steel ingot operating rate has declined one point this week to 91.5 per cent of capacity.

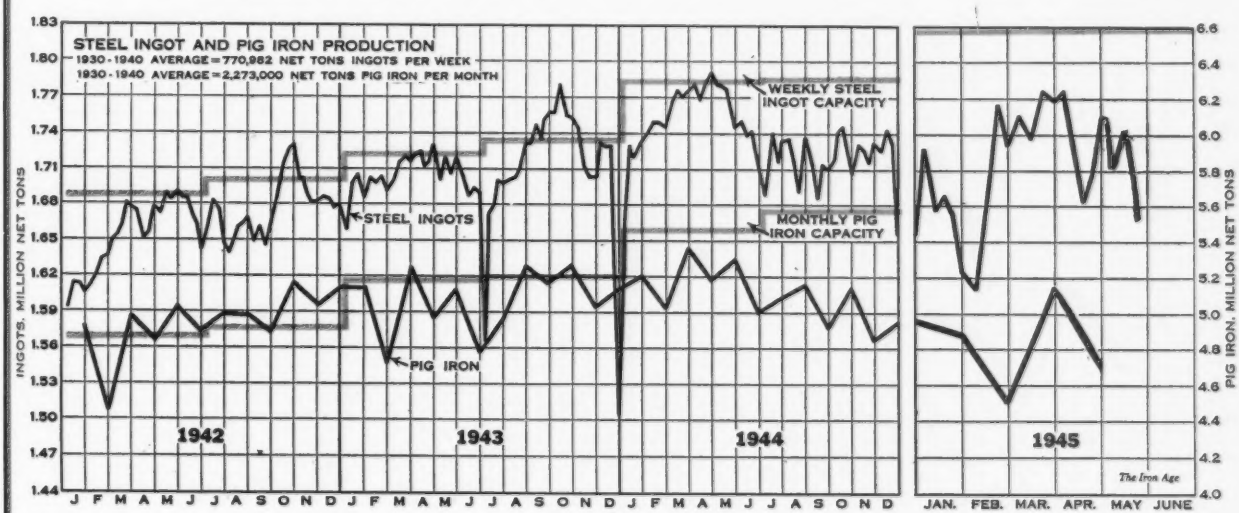
• **USED MACHINE TOOLS**—In its recent Indianapolis sale of surplus used machine tools and miscellaneous equipment manufactured prior to 1936, and hence not subject to the Clayton Formula, the RFC sold 42 of the 102 lots offered. No bids were received on 29 lots and bids were rejected on 31 lots. The reported cost of the equipment offered was $244,818, ceiling price $126,163, appraised valuation $42,110, and total bids received $17,805. Of the lots sold, the reported cost was $75,907, ceiling price $39,333, appraised valuation $13,444, and total of high bids $13,917. On the group for which no bids were received, the reported cost was $33,476, ceiling price $19,163, and appraised valuation $6474. The reported cost of the rejected lots was $135,434, ceiling price $67,666, appraised valuation $22,192, and the total of high bids $3887. Successful bidders were approximately evenly divided between machine tool users and dealers. There were 42 bidders offering a total of 188 items. Of these, 19 were successful. On a group of newer equipment offered at the same time, and subject to the Clayton Formula, the RFC sold 89 items at $103,252 and still is considering offers on 18 additional items totaling $14,270.

• **FABRICATED STEEL ORDERS**—April bookings for fabricated structural steel for bridge and building construction have continued to show an encouraging gain for the past several months and are larger than for any month since July 1942. The bookings as reported to the American Institute of Steel Construction, Inc. by companies representing 76.4 per cent of the total average booking of the industry during the years 1923-1925, totaled 94,452 tons as compared with 88,740 tons reported for the preceding month and 51,498 tons reported for the corresponding month of last year. The reported shipments for bridge and building construction totaled 50,701 tons compared with 44,495 tons reported for the same month last year. The tonnage reported available for future fabrication on April 30 was 162,544 tons.

• **ELECTS AND RE-ELECTS**—New additions to the board of directors of the American Iron & Steel Institute elected recently were W. P. Snyder, Jr., chairman of Crucible Steel Co. of America, replacing F. B. Hufnagel; and Charles M. White, president of Republic Steel Corp., replacing T. M. Girdler, chairman of Republic Steel. Directors re-elected at the expiration of their previous terms were: J. H. Carter, president of Pittsburgh Steel Co.; E. G. Grace, president of Bethlehem Steel Co.; Charles R. Hook, president of American Rolling Mill Co.; H. E. Lewis, chairman of J & L Steel Corp.; J. H. Parker, president of Carpenter Steel Co.; J. Lester Perry, president of Carnegie-Illinois Steel Corp.; Henry A. Roemer, chairman of Sharon Steel Corp.; Walter S. Tower, president of American Iron & Steel Institute, and E. T. Weir, chairman of National Steel Corp. Officers of the institute, all of whom were re-elected, are Walter S. Tower, president, B. F. Fairless, president of U. S. Steel Corp. and Frank Purnell, president of Youngstown Sheet & Tube Co., both re-elected vice-presidents; H. L. Hughes, vice-president of U. S. Steel Corp., re-elected treasurer, and G. S. Rose re-elected secretary.

• **MORE ABOUT STEEL PRICES**—One publicity-shy OPA official who thinks OPA price increases are niggardly said, according to our Washington editor, that if the price agency wants to put the little steel company permanently out of business, to the advantage of larger companies, all it has to do is to continue its present adamant stand. It may be added, too, that because of competitive conditions confronting them, the small steel companies are not satisfied with a reported offer to OPA to grant them emergency prices that would be higher than established levels for the larger producers. The desire is for a uniform scale of prices.

• **'WHEN' IS THE QUESTION**—Automobile companies may place their steel orders, but when they get delivery is another question. The steel industry is being deluged with requests to give some kind of delivery commitments. The companies have no more idea of when they can give firm promises than the auto industry knows when it can produce cars. Order books are still heavy with CMP rated orders and the tightest item is sheet steel. There is a chance that this condition may change drastically, but no one in the steel industry believes it will change that much in the next two months. After that time some sources look for a substantial easing in steel supplies for such civilian consumers as the auto companies. Meanwhile there will be the greatest pressure in years placed on the steel companies to give some kind of a delivery promise as all automobile manufacturers try to get there first.



Steel Ingot Production by Districts and Per Cent of Capacity

Week of	Pittsburgh	Chicago	Youngstown	Philadelphia	Cleveland	Buffalo	Wheeling	South	Detroit	West	Ohio River	St. Louis	East	Aggregate
May 22	94.0	98.5	89.0*	96.5	94.5	87.0	91.5	95.0	95.5	50.0	95.5	75.0	95.0	92.5
May 29	94.0	97.5	83.0	95.0	94.0	100.5	91.5	95.0	94.5	78.0	103.0	75.0	69.0	91.5

* Revised

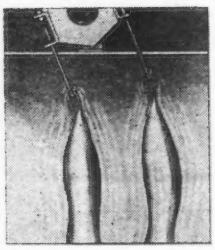
PROTECTION
against "AIR RAIDS"

Dust takes no time out for its damaging attack on production equipment. Every hour — every minute, dust strikes at your pocketbook.

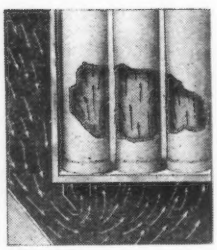
Dust control, however, can be effected easily, at a cost that makes it a wise investment. Effective control depends upon two main conditions: *First:* hood design at the dust source is of vital importance. Proper air volume and velocity are necessary to gather the dust into a correct piping system. *Second*, efficiency of dust collector operation must be considered such as horsepower consumed by pressure loss through the collector, and the increase in pressure loss during operation. Likewise, maintenance cost must be considered.

Through simplified and efficient design, Dustubes have set new high standards for controlling dust. Tests on past installations have shown a collecting efficiency of more than 98% by weight, and Dustubes are extremely inexpensive and easy to operate and maintain.

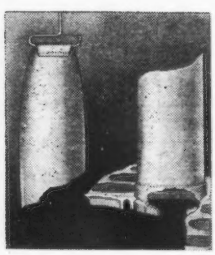
An American engineer can apply the many advantages of Dustube Collectors for an efficient, practical answer to your dust problem. Write for further information.



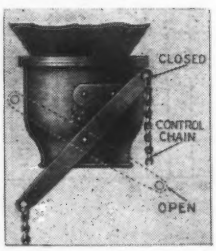
SHAKING DEVICE — Accumulated dust on tube is completely removed by the whipping motion imparted by the shaking mechanism when the tubes are deflated.



HIGH EFFICIENCY — Extremely fine dusts, particularly those within the low micron size range are trapped with nearly 100% efficiency by weight.



SIMPLICITY OF DESIGN — Except for an occasional inexpensive tube replacement, little maintenance of a Dustube is ever required.



EASY DISPOSAL— Trapped dust shaken from tubes is discharged from storage hopper through a specially designed outlet valve.

AMERICAN
FOUNDRY EQUIPMENT CO.

505 S. BYRKIT ST. MISHAWAKA, IND.

ARMY E NAVY

AMERICAN dustube dust collectors

Auto Builders Face Difficult Task in Getting Steel Sheets

Pittsburgh

• • • **Without priority** assistance, the automotive industry is going to find the going rough in getting sheets during the coming four months. Currently, there is an estimated 200,000 tons industry carryover into the third quarter on sheets, and mill books are loaded approximately to capacity throughout the balance of the year. Cancellations of steel orders have been increasing, it is true, but the cancellations have not been for flat rolled items. To date, the bulk of cancellations for immediate delivery items have been in tank armor and shell steel, while the cancellations carrying through the balance of the year have shown no evidence of easing the sheet picture.

The steel industry at present cannot make firm commitments to the automotive industry for sheets—that much is certain. Perhaps by the end of August or early part of September this picture may change, but only if the Army and Navy slash orders tremendously. With other sheet consumers, such as washing machine and refrigerator manufacturers, there may be considerable back-door business in sheets throughout the country, and the criticalness of flat rolled might even instigate a black-market on these items. But, the automobile manufacturers must have assured regular deliveries of high quality sheets, something that steel producers cannot promise under present circumstances.

At present, there are still rather critical war orders involving sheets that are going begging. This week U. S. Gypsum was having considerable difficulty finding a home for some hot rolled, 10 gage landing mat sheets for third quarter delivery. There wasn't a steel company that could take the order, despite a high rating on it.

The Office of Civilian Supply, which, as a claimant agency, has furnished many civilian industries with required steel items, may come in on the deal to furnish the automobile producers with sheets. Even with this aid, however, it could be extremely difficult to assure sheet deliveries.

One possibility that cannot be overlooked is that the 200,000 automobile quota set for this year may take into consideration a tight sheet situation. If automotive people get sheets in large quantities just during the last quarter of the year, they may likely be able to hit the 200,000 car mark. During pre-war years, normal production was between 4,000,000 and 5,000,000 cars a year. Taking for granted that between 60 and 80 per cent of automotive production facilities and manpower will be tied up in war business, a rather weighted estimate, it is conceivable that the 200,000 cars could still be produced in the last quarter if sheets are available.

Thus, it appears that automobile output during 1945 will be determined largely upon the supply of sheets. By the end of August, the sheet picture might be changed all around, but at the present time, there is little hope of automobile manufacturers getting any immediate commitments from steel producers on sheet deliveries. Everything hinges on whether or not there will be some wholesale sheet cancellations by the Army and Navy during the coming three months.

Another factor that may prove a bottleneck to automobile production is the parts supplier situation. Such items as batteries, electrical cable, spark plugs, etc., may prove a tough nut to crack. The small automotive parts suppliers, while it is not known how busy they are with war work, may find themselves embarrassed if automobile companies suddenly descend on them with substantial orders for auto parts. Such outfits as stamping companies could well be busy as container programs, and similar war bees in the bomb and rocket programs, jobs that tie up their equipment and manpower.

Plastic Production Disclosed

St. Louis

• • • **Volume production of** a new thermoplastic, combining heat resistance with high insulating efficiency in such uses as radar, television and facsimile transmission, has been announced by Monsanto Chemical Co. The new thermoplastic, known as Styramic HT has a heat distortion point of 236 deg.F., yet can be precision molded or machined, it is claimed. It is being produced in a Defense Plant Corp. plant adjoining Monsanto's plastic division properties at Springfield, Mass., and operated by Monsanto. The entire output will go to military requirements. No claims are made for possible low cost production in the immediate postwar period, and the output is slated for specialty uses where performance rather than price is the dominant factor.

COPENHAGEN FROM THE AIR: *When the VE SHAEF mission flew into the Danish capital, this was their view. Unbroken factory rooftops and unmarred rail yards present an unusual contrast to most of Europe.*

Ordnance Needs Now 30% Less Than At May 1 Peak, Lt. Gen. Campbell Says

Pittsburgh

• • • **Lt. Gen. L. H. Campbell, Jr.,** chief of Ordnance, stated this week that Ordnance procurement at the end of May would be on a 30 per cent less basis than on May 1, which he said was the peak in Ordnance procurement. Furthermore, he stated that practically all usable fighting equipment in Europe would be transferred to the Pacific for the knockout blow against Japan. Despite the fact that there is much captured enemy equipment in Europe, he expects that it will be of little use to this country against Japan because it would take too long to either train American soldiers to use it or convert it to American type equipment.

Speaking before the Army Ordnance Association here on May 23, he pointed out that the war against Japan will present many difficulties for Ordnance that were not encountered in the European War. The nature of the areas in which fighting will take place is such that the need for big guns and heavy armor will be drastically reduced. Lack of highways and railway systems comparable to those in Europe means that heavy equipment cannot be moved overland in any great quantities. Also, on the basis of equipment and weapons so far employed by the Japanese, American soldiers will not face any great number of high quality heavily armored vehicles or much heavy artillery. Thus, the production schedule for Ordnance will place greater emphasis on lighter equipment.

Supply lines to the Orient, three times as long as those for Europe, also present new and different problems. The American freight and shipping systems will have to move material from east to west, a reversal of the normal movement of most goods in this country. Depots and arsenals face many transportation complications as they package products for the Pacific. Overhead or service troops will have to be increased. More depot troops will have to be used, because there will be more way-stations between this country and the fighting fronts. Climatic and geographical conditions, coupled with less developed nature of terrain, means greater problems both in storage and in maintenance. With about 2500 major items which Ordnance produces and services, the storage and transportation problem is terrific.

Gen. Campbell congratulated American industry on its solution to the huge problem of supplying two fighting armies, one in Europe and the other in the Pacific. He pointed out several of the difficult tasks accomplished, such as relieving the machine tool bottleneck by increasing the use of stamped metal products, creating incentive with manufacturers holding "cost-plus-fixed-fee" contracts, and solving other similar engineering and management problems. He mentioned that since 1941, American industry has produced more than 100,000 tanks, 3,400,000 trucks, 12,000,000 rifles and carbines, 2,500,000 machine guns, 1,000,000,000 rounds of artillery ammunition, 700,000 artillery pieces, and 40,000,000,000 rounds of small arms ammunition for the Ordnance. These, he said, are only a few of the items produced, and the totals for armored cars, self-propelled guns, bayonets, pistols, and many other weapons of war are equally impressive. Before, the war in Europe actually came to a close, Ordnance troops were repairing guns, tanks, trucks, tires, and the many other pieces of ordnance equipment, utilizing, by the way, labor from the civilian populations of France, Italy, Belgium, Holland, and Luxemburg. When this material is renovated it will be packed for its long trip to the Pacific theater, a tremendous task in itself.

NEW M-26: *Side view of the new American M-26 tank, known as the General Pershing. The M-26 is heavier than the Sherman tank, has a low silhouette and is provided with greatly increased gun power and armor protection. The Pershing can score hits at ranges formerly thought impossible by Army Ordnance.* (*See* THE IRON AGE, *April* 19, *p.* 105).

Wing Production Shifted

Detroit

• • • **Production of center** wing sections for Curtiss Helldiver planes is being shifted from Detroit to the Curtiss-Wright Corp. plant at Columbus, Ohio.

A joint announcement from Curtiss-Wright and Chrysler Corp. whose De Soto division is now doing the job, said that the shift will be completed during the next five months. The announcement, which confirmed an earlier story to this effect (THE IRON AGE, Apr. 26, 1945) stated that the movement of the job piecemeal will result in continued production without any loss to final assembly schedules.

Foundrymen Elect Eaton

Detroit

• • • **E. C. Hoenicke,** assistant to general manager, foundry division, Eaton Mfg. Co., has been elected chairman of the Detroit Chapter of the American Foundrymen's Association for the 1945-46 season. Other officers include:

Vice-Chairman, A. H. Allen, Detroit editor, Penton Publishing Co.; Secretary, H. H. Wilder, Vanadium Corp. of America; Treasurer, W. W. Bowring, Frederic B. Stevens, Inc.

Navy Prepares and Segregates Pacific Ferrous and Nonferrous Scrap

By EUGENE J. HARDY

Pearl Harbor, T. H., (Delayed) • • • **As far west as the Marianas, on islands which were the scenes of savage fighting only a few months ago, the Navy has been returning brass and lead scrap from the Central and Western Pacific war areas to the United States and will continue to send any critical materials that are needed.**

In these forward areas steel scrap is not being processed and shipped back, but is piling up largely because of lack of shipping and also lack of demand in the United States. Although many sources have tried to minimize the importance of the Pacfic as a source of scrap and there is little doubt that the tonnage returned thus far has been insignificant, supply officers with whom I talked all through the Pacific did not think this would be the case as the tempo of war increased. It was pointed out that as shipping became freer in the Pacific more steel scrap could be shipped back if the mills in the United States wanted it.

Although much disappointment has been registered over the quality of battlefield scrap returned from Europe this has not been the case in this theater, for practically all scrap is contracted for before shipment. Officers were more than willing to have mills that have purchased Pacific scrap contacted in regard to the quality of the material received.

The largest scrap activity in the Pacific is centered in the Makalapa Salvage Yard, Material Recovery Unit 14, in the 14th Naval District. Located at Pearl Harbor and in charge of Lieut. (jg) William H. Glosser, SC, USNR, Johnstown, Pa., a former scrap dealer, this unit receives all kinds of material from ships of the fleet and other sources as well as all Navy, Marine and Coast Guard activities on Oahu.

During my visit with Lieutenant Glosser one ship was being loaded with 5000 tons of steel scrap, ready for the charging box, for direct shipment to Sparrows Point, Md. Another ship, also headed for Sparrows Point, was also ready to be loaded, while a third ship was expected momentarily, but its destination was not made known. All of the scrap being loaded was cut into 5 ft. 18 in. lengths, ready for the charging box, as is all steel scrap prepared here, an accomplishment in which the unit takes particular pride.

Both steel and copper scrap have been piling up at Pearl Harbor for many months, because of the easier situation on the West Coast. The ships referred to above are the first to head directly for the East Coast. Shipments since the outbreak of the war have been small, but not because of a lack of scrap in the area. In 1942, 19,000 tons of steel scrap were returned to the States, in 1943 this jumped to 31,000 tons and last year dropped back to 11,000 tons.

Lieutenant Glosser's unit at Makalapa has been operating only about six months. Previous to that time scrap was lying all over the countryside. With only 34 men to do the job and most of these on temporary duty, some order and efficiency has been put into the operation.

Material received here consists of battle damaged ship sections, ordnance, aircraft, stripped ship gear, structural parts of ships, wiring, automotive equipment, turbines, cans and drums and all of the debris of war left behind by a fighting navy.

Much of this equipment is salvaged by the various Navy activities on the island and all of it is stripped of all usable parts before it is turned into scrap. Thousands of dollars of damaged material is sent through the unit to other outfits that can repair and use it. In a recent 30-day period, the unit salvaged $67,166.10 worth of goods that will be used again against the Japs. During the same period they prepared for sale $316,352.64 worth of scrap metal and lumber. Most of the cans and drums are cleaned, straightened out and put back into use. Those beyond repair are loaded with brass and copper pipe and other like metal to facilitate shipment. Large quantities of used shells are also returned for reprocessing.

At one time a warship needed some steel plates to make necessary repairs. The plates were found almost immediately in the scrap pile and were turned over to the ship, saving the time necessary to make requisitions, draw the metal and cut it to the right size.

NAVY SCRAP: *Scrap metal from all over the Pacific war zones is returned when shipping is available to Pearl Harbor, where it is processed for shipment to the United States.*

Seven Months' War Backlog Still On Toolmakers' Books

Cincinnati

• • • **That the machine** tool industry has about seven months' work as announced by the WPB, was agreed to by a machine tool executive here last week. While not permitting the use of his name, the executive said:

"But that doesn't mean that at the end of the seven months the bottom is going to fall out. For instance, we have a whole book full of orders 'on ice.' Many are in connection with reconversion. As WPB restrictions and government requirements ease off, these orders will come alive.

"Right now they are not included in demand for consumer-capital goods, such as refrigerators, autos, stoves and the like when the time comes. Meanwhile in the local plants, I believe that I can say we are absorbing war contract cutbacks with not too much difficulty. Many departments have been reduced to one and a half or one shift production and there is even talk of cutting that this summer.

"Our young men have gone to war and we just haven't the manpower left for around the clock operation, even if we had the orders to substantiate it, which we have not. Reduction of personnel has been handled to prevent any possible dislocations."

War Manpower Commission and WPB officials locally are in agreement that any lay-offs caused by cutbacks can be more than absorbed by war plants still critically short of needed manpower. In fact, they have been worried by the fact that not enough of the workers who have been laid off are going to other jobs. Many just seem to disappear, the officials said. A survey of the Ohio WMC recently disclosed that only about 4400 workers in the state have been laid off because of cutbacks since VE-Day.

Use of $100,000,000 For Road Construction Urged by Steel Group

New York

• • • **The American Institute** of Steel Construction recently urged immediate use of $100,000,000 of federal funds available for plans, specifications and rights of way on highway construction to provide the means for vast postwar re-employment of veterans.

The federal fund of $100,000,000, if evenly matched by state funds of the same amount, would make available necessary work in every community of the nation at the time the war with Japan ends, the institute stated. To get the enormous highway and bridge program under way, most projects will require from one year to three years of careful planning, the institute pointed out.

The "planning funds" are made available under the Federal Highway Act of 1944. This act provides for $500,000,000 annually for three years in federal funds, of which $100,000,000 would be available for planning immediately and the remaining $400,000,000 to be made available only at the end of the war.

Employment would be spread from the manufacture of road equipment to materials and thence to the actual road building projects, giving skilled workmen in a variety of industries and trades full-time employment over a period of at least three years, the institute stated.

The institute said that the planning for bridges alone, necessary in almost every state, would require from 12 to 18 months to complete, and should not be put off further if the bridge program is to keep abreast of the paving program anticipated in the Highway Act of 1944.

It was estimated that 445,000 tons of bridge steel would be used annually on the highway program, or 1,335,000 tons over a three-year period.

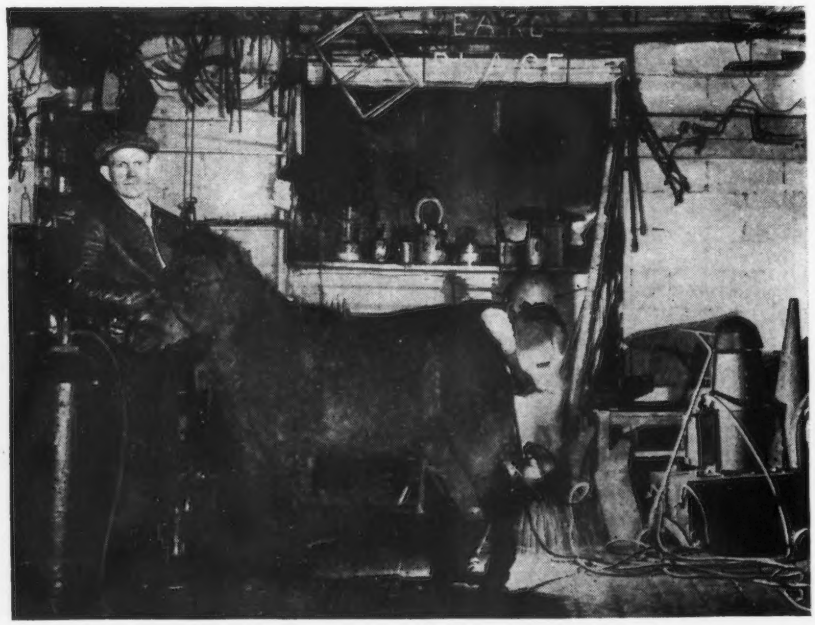
Canada's Pig Iron And Steel Output Reaches New Daily High Point

Toronto

• • • **Production of pig iron** and steel in Canada for April dipped below the total for the previous month, but this was largely due to the fewer days in that period. On a daily basis steel output was at an all time high record of 9140 tons against the previous high of 8950 tons per day reported for March. Pig iron output was down to 5202 tons a day from 5339 tons daily in March. Production of ferroalloys in April was at the highest monthly total for the year. Despite curtailment in some branches of Canadian war production, it is not expected there will be any decline in iron and steel production in this country. With reduced demand on war business there will be a sharp pick up in requirements for civilian production which is slated for sharp improvement almost immediately, according to word from government sources.

For the month of April pig iron production totaled 156,070 net tons compared with 165,517 tons in March

RESOLING HORSESHOES: *Charles H. Chism, veteran blacksmith of Coshocton, Ohio, applies his idea of arc welding worn surfaces of horseshoes on a mine pony. A light coated, high carbon electrode of 1/8 in. dia., specially designed to resist shock and abrasion, is used for these horseshoe resurfacing jobs.*



and 170,864 tons in April 1944. Output for the month under review included 122,445 tons of basic iron; 22,076 tons of foundry iron and 11,549 tons of malleable iron.

In the first four months of the year output of pig iron totaled 627,343 net tons against 612,417 tons in the corresponding period of 1944 and 565,154 tons in 1943.

Production of ferroalloys in April amounted to 18,350 net tons, compared with 16,434 tons in the preceding month and 12,818 tons in April 1944. The month's output included ferrosilicon, silicomanganese, ferromanganese, ferrochrome, chrome-x and ferrophosphorus.

Production of steel ingots and castings in April totaled 274,213 net tons compared with 277,461 tons in March and 260,825 tons in April 1943. The month's output included 260,144 net tons of ingots and 14,069 tons of steel castings.

In the four months ending with April cumulative production of steel ingots and castings totaled 1,070,860 net tons against 1,002,402 tons in the same period of 1944 and 987,915 tons in 1943.

Job Seniority Order Ruling Made by Officer

Cleveland, Ohio

• • • **Seniority on a job** will have little bearing among veterans returning to their old jobs, according to a decision announced here by Comm. C. D. Finn, draft liaison officer.

In Commander Finn's opinion, the first veteran to return to an old job with his employer is entitled to the job regardless of the seniority others may have had who are still in service. This decision came out of a veteran employment problem in a plant here.

Two veterans, one with seven years seniority and the other with five years seniority, worked in a department on identical jobs; both entered service. In the meantime, only one of the jobs remained due to the conversion of production methods. Recently the five year man was discharged and returning to the plant, he was rewarded the remaining job. Now the seven year man is a discharged veteran and also has returned to the plant.

The management referred the case to Commander Finn, who ruled that the first veteran, in this case the five year man, should keep the job and that the seven year man should be given a different job of equal seniority, status and pay.

War Emergency Housing Caused Six-Fold Rise In Federal Housing

New York

• • • **Emergency needs for** housing war workers were largely responsible for a six-fold increase in federal housing between July 1940, and the end of last October, bringing the federal total to more than 800,000 dwelling units, while 150,000 units were built in the same period by local housing authorities, according to a study of the growth of public housing prepared by the National Industrial Conference Board.

The Federal Government's investment in housing rose from $500,000,000 to about $3,000,000,000 in a little over four years. The latest federal housing appropriation of $66,000,000 on April 28 is to provide shelter for 20,000 war worker families, besides 1600 trailers and 6000 dormitory accommodations.

During the same period, according to the study, private enterprise provided one million dwelling units of permanent character for war housing at a cost of about $4,000,000,000.

Over one-half of the public war housing program is concentrated in eight states, according to the percentage of dwelling units assigned: California, 17 per cent; Washington, 7 per cent; Texas, 6 per cent; Pennsylvania, Virginia and Ohio, 5 per cent each; and Michigan and New York, 4 per cent.

About 41 per cent of the Federal Public Housing Authority dwellings were assigned to ten congested war production areas. These are Hampton Roads, Mobile; Portland-Vancouver, Charleston, S. C.; San Diego; San Francisco Bay; Puget Sound; Muskegon, Mich.; Detroit-Willow Run, and Los Angeles.

The Conference Board's study draws attention to the fact that a good part of the wartime public housing program was explicitly intended by Congress to meet a temporary emergency need. More than half, or 51.1 per cent, of the dwelling units constructed or converted by federal and local housing authorities are officially classed as "temporary." In addition, 78,000 units are classed as "demountable," 81,000 as "stopgap," and 48,000 as HOLC conversions, leaving only 198,000 units, or 23.9 per cent, as "permanent."

Reconversion Action Speeded

Chicago

• • • **To provide special** attention to applications under Priorities Regulation 24 for assistance in securing equipment and facilities for reconversion, James M. McConnell, War Production Board district priorities chief, will personally process all such applications.

ELEPHANT POWER: *An 80 year old elephant pushes a boxcar of the Bengal & Assam Railway in India on a tea garden siding at Bogapani near Ledo, thereby making it possible to do without a shunting engine at this siding. The railway is operated by the Military Railway Service of the U. S. Army.*

CIO-USWA Adopts Policy Approving Organization of Foremen and Assistants

Pittsburgh

• • • While the CIO-USWA has followed a policy of "hands off" with regard to foremen, gang leaders, and straw bosses, this week that policy was dropped. The CIO will start an organizing campaign shortly among all bosses who do not have "hire and fire" authority. This will affect many thousands of workers, including those in the steel industry. The move of the CIO-USWA follows intense activity in the direction of foremen organizational drives, especially in the automotive field.

The CIO constitution specifically provides that every employee in plants under CIO jurisdiction except those having the power to hire and fire shall be eligible for membership. Up to now, the union acceded to the urgent demands of the companies that certain groups of so-called foremen and assistant foremen be excluded from the provisions of collective bargaining units. According to the union, this practice resulted in many employees being deprived of protection of collective bargaining agreements.

For more information see THE IRON AGE, *May 24, page 96; April 15, 1943, page 83.*

The international executive board of the United Steel Workers of America, on Friday, May 25, adopted the following policies in regard to organizing supervisory employees:

(1) With respect to supervisory personnel who have the right to hire and fire . . . no effort shall be made by this union to organize them into the organization.

(2) With regard to foremen and assistant foremen, gang leaders and others of this character, who are actually directly related in their work to the production and maintenance workers, the union shall endeavor to negotiate with the several employers for the purpose of arriving at a mutually satisfactory agreement pursuant to which our existing agreements covering production and maintenance workers shall be extended to include such additional employees.

o o o

J & L Rescinds Strike Action

Pittsburgh

• • • Both the Jones & Laughlin Steel Corp., and the CIO-USWA backpedaled this week and 64 soaking pit employees at the company's Pittsburgh works returned to work after a 12-day strike, during which the company replaced the crews with new workers. The strikers had been given until May 18 to return to work in a "work-or-quit" ultimatum from the company, backed by the union. When they failed to go back to work, they were replaced by new workers hired from other departments in the Pittsburgh works. However, blooming mill employees and riggers backed the strikers and refused to handle material processed by the new workers.

As a consequence of the original strike, some 1900 workers were made idle and about 70,000 tons of semi-finished steel production lost. The strikers returned to work at midnight May 25, after voting to accept the War Labor Board arbitrator's wage rate decision, the original cause of the strike.

A statement issued jointly by David J. MacDonald, secretary-treasurer of the CIO-USWA, and Harry D. Stark, general superintendent of the J. & L. Pittsburgh workers, explained:

"Except for the war emergency, there exists no legitimate reason why the corporation should take these men back or why the union should ask it to do so. The corporation does not wish to alter its position, and the union does not wish to countenance such action by any of its members.

"However, the corporation and the union recognize that private interests must be subordinated to the national interest in the winning of the war against Japan."

SUPPLIES TIGHT: *Steel companies are still finding it necessary to take off blast furnaces for much needed repairs. It may be that supplies of pig iron will remain tight for some time as the running of the furnaces to meet war demand has taken many of them beyond the time when under ordinary conditions they would have been taken down for repairs. In April blast furnaces in the country operated at 86.4 per cent of rated capacity compared with an average of the first four months amounting to 88.2 per cent of capacity. With pig iron supplies remaining in a tight position and with scrap also firm it is expected that steel men will watch pig iron output trends closely over the next few months.*

Blast Furnace Capacity and Production—Net Tons

Source: American Iron & Steel Institute

	Number of Companies	Annual Blast Furnace Capacity	PRODUCTION							
			PIG IRON		FERRO-MANGANESE AND SPIEGEL		TOTAL		Per Cent of Capacity	
			April	Year to Date	April	Year to Date	April	Year to Date	April	Year to Date
DISTRIBUTION BY DISTRICTS:										
Eastern	12	12,988,970	875,473	3,394,307	34,340	116,293	909,813	3,510,600	85.1	82.2
Pittsburgh-Youngstown	15	25,904,240	1,879,430	7,747,048	21,951	79,041	1,901,381	7,826,089	89.2	91.9
Cleveland-Detroit	7	6,589,500	505,356	1,992,502	.....	.....	505,356	1,992,502	93.2	91.9
Chicago	7	14,070,510	1,043,652	4,213,031	.....	.....	1,043,652	4,213,031	90.1	91.0
Southern	8	4,924,670	245,698	1,264,328	17,021	57,140	262,719	1,321,468	64.8	81.6
Western	4	2,836,000	162,738	657,521	.....	.....	162,738	657,521	69.7	70.5
TOTAL	37	67,313,890	4,712,347	19,268,737	73,312	252,474	4,785,659	19,521,211	88.4	88.2

Government-Owned Equipment Now May Be Bought for Civilian Production

Washington

• • • **War contractors still** using government-owned machine tools and other equipment in private plants may purchase them immediately for use in non-military production, the Surplus Property Board said on May 24. Sales of equipment will be governed by SPB Regulation 6, effective immediately. Sales to contractors under the regulation will not result in the concentration of equipment in the hands of large enterprises, SPB said.

Numerous safeguards against what SPB calls "the taking of unfair advantage" are found in the regulation, and include:

Withholding from sale, whenever necessary, items that are apparently in short supply. This will prevent interference with war production and assure equitable distribution, SPE says.

A long list of machine tools and other plant equipment that must be inventoried and reported to RFC quarterly by the owning agencies. Through these reports the board can find out the supply of each item and prevent hogging of stocks by a small group.

The protection of sublessees and subcontractors who are eligible purchasers. This provision will make machinery available to subcontractors using it rather than to prime contractors who do not ordinarily use the equipment.

The requirement that purchasers give up purchase options or similar privileges they now hold under the same facilities contract with the government. Removal of options permits the government to make such equipment as is not necessary to the contractor's peacetime production readily available for general sale when it becomes surplus.

Sales at fixed prices whenever possible and developing price formulas where none now exist.

All negotiations for sales involving $1,000,000 or more of plant equipment to be submitted to the Attorney General for clearance under the anti-trust laws.

Each purchaser must certify at the time of purchase that machinery will be used in his own production and not purchased for resale.

The new regulation applies only to what are known as "scrambled facilities"—privately owned plants in which war goods are produced with government-owned equipment. It does not affect government-owned plants operated by private contractors.

Krug Says Industry Will Solve Reconversion On Its Own Initiative

Washington

• • • **Chairman J. A. Krug** of the WPB in repeating that the job of giving top priority to military programs still lies ahead, expressed the idea that American industry will solve reconversion problems on its own initiative with a minimum of government assistance, with the pent-up demand for civilian goods being the keystone of a strong economy in the period ahead.

In the May 28 report on war production and reconversion, it is pointed out that from a civilian durable goods production level of $7,000,000,000 this year, a goal of $16,700,000,000 or more than double the 1939 level, may be attained a year from now if present estimates of needs for the one-front war remain the same.

With war production in its maturity and cutbacks being made in increasing numbers, Mr. Krug stated that we would rely to a large extent on "natural forces" in solving problems of temporary unemployment rather than attempting to set up specific government controls for the solution of such problems. WPB thinking continues to be that the transition can best be handled with a minimum of regulations and production controls, it is said.

In pointing out the steps that WPB has already taken in the direction of releasing industry from wartime controls, it is said that in addition to the 156 orders already revoked, some 83 additional are expected to be out within six weeks.

Of the 51,200,000 civilian workers in the country at present, it is said that 44,600,000 will be unaffected by changes in munitions schedules with a total of 6,600,000 jobs most likely to be directly affected.

A breakdown showing the number of jobs by industries follows:

Jobs Not Directly Affected by Cutbacks	
Agriculture	7,750,000
Transportation and Utilities	3,800,000
Construction	600,000
Mining	800,000
Trade and Service	11,400,000
Manufacturing	
Iron and Steel	800,000
Machinery	2,000,000
Other (Mostly soft goods)	7,700,000
Government (excluding War Agencies, Arsenals and Navy Yards)	4,400,000
Miscellaneous	5,350,000
TOTAL	44,600,000

Jobs Most Likely to Be Affected by Cutbacks	
Aircraft	1,600,000
Ships	1,300,000
Ordnance & Signal Equipment	1,800,000
War Chemicals	300,000
Federal War Agencies	1,600,000
TOTAL	6,600,000
TOTAL EMPLOYMENT	51,200,000

Pullman Ordnance Contracts Reduced

Chicago

• • • **Terminations of ordnance** contracts at the Hammond works of Pullman-Standard Car Mfg. Co. have been announced by the Chicago Ordnance District. The cancellations involve 155 mm. gun carriages, 105 mm. howitzer carriages, 81 mm. mortars, transport wagons, gun mounts, limbers and bogies.

Production of large shells for the Navy are not affected, and Army contracts for $3 million worth of artillery spare parts to date have not been modified.

The four year war production record of the plant includes more than $300 million worth of tanks, guns, shells, and transportation equipment, including 3400 tanks for the United States and 500 for the British; 21,000 mortars; almost 10,000 carriages for light, medium and heavy artillery; 2600 limbers; 1200 bogies for heavy guns; and 514 new or converted transport wagons. In addition the plant has forged 303,000 155 mm. shells for the Army, and has machined 870,000 plus a very substantial number for Navy. Sizable orders have also been completed for extra spare parts in addition to those delivered along with individual armament units.

At its peak, the plant employed 5325 workers. More recently as contracts were completed and earlier Army cutbacks put into effect, the payroll dropped to around 2500.

WPB Speeding Priorities Aid For Needy Liberated People of Europe

Washington

• • • **WPB has assigned** high priorities to $5,000,000 worth of equipment needed for draining large areas in Holland, flooded by the retreating German army. In making this announcement WPB Chairman J. A. Krug said that some of this will be used by the allied military forces, some purchased for cash by the Dutch and some provided by the United States as lend-lease in support of the occupation of Germany and the redeployment of American forces.

Commenting on President Truman's recent letter asking war agency heads to grant all priorities necessary to meet minimum civilian requirements of allied countries liberated from Germany, Mr. Krug said:

"WPB will continue to give priorities assistance to the needs of these war damaged areas to the fullest extent compatible with the successful prosecution of military operations and the maintenance of our essential domestic economy.

"For example, WPB has assigned high priorities to the $5,000,000 worth of equipment needed for draining large areas in Holland, flooded by the retreating German army. An emergency requirement for $170,000 worth of pumping equipment and pipe has been given AA-1 rating to relieve a critical water shortage in Athens, Greece. We also have provided some quantities of fabrics for clothing destitute populations.

"Perhaps even more important than these immediate relief needs, however, are the requirements for materials and equipment that will enable these war damaged areas to reactivate their domestic agriculture, industry and transportation, at least to the extent that they may become self supporting and thereby relieve us of some of the demands for civilian goods. In this connection, WPB has granted priorities assistance for substantial quantities of industrial, transportation material and equipment.

"For example, 625,000 tons of carbon steel have been allocated to France for the first nine months of 1945, in addition to smaller tonnages for other liberated countries. Seven hundred locomotives and 10,000 freight cars have been authorized for production for France, and most of these will be produced in the remaining months of this year. Additional locomotives, to the number of 180, have been scheduled for eastern European countries supplied by UNRRA and UNRRA freight car schedules are now being developed by WPB.

"Some 11,000 commercial trucks have been allocated to liberated European areas during 1945, in addition to an unknown number of used military vehicles that will be released in Europe by our armed forces. Priorities have been given to the purchase of a substantial number of key machine tools and other industrial equipment items needed to permit the reopening of essential industrial establishments in western Europe and to repair railroad equipment. We have authorized production, at an AA-3 rating of $9,500,000 of portable and "quick erecting" steam and diesel power generating equipment for UNRRA countries.

Coke Price Relief Granted by OPA

Washington

• • • **Effective May 26,** OPA has increased the ceiling prices for beehive oven coke produced in the Connellsville district. The increases are 25c. per net ton for furnace coke produced in hand drawn ovens and 50c. per net ton for furnace coke produced in machine drawn ovens. This action establishes price of $8 per ton for hand drawn furnace coke and $7.50 for machine drawn furnace coke, f.o.b. cars at ovens.

Beehive oven coke, other than beehive oven furnace coke (which would include foundry coke) produced in either hand drawn or machine drawn ovens has been priced at the established ceiling price for furnace beehive coke plus $1.50 per net ton, instead of the addition of $1.25 or $1 a ton allowed previously for hand drawn and machine drawn coke, respectively.

OPA said that the increases are designed to compensate producers for higher costs resulting from the increase in coal miners wages authorized in April.

The Connellsville district was defined as the western part of Pennsylvania and the West Virginia counties of Barbour, Monongalia, Preston and Upshur.

RFC Puts Steel Plant Operated by Eaton Co. On Market for Sale

Washington

• • • **The RFC has put a** steel plant at Massillon, Ohio, on the market. The plant is being operated by the Eaton Mfg. Co., Cleveland and is producing bullet core steel rods. It is being offered to any interested buyer, to be taken over as soon as it is released from production of war equipment. The Eaton company has discussed possible purchase of the plant and RFC said that any other person or persons interested in purchasing the property should communicate with the RFC Cleveland agency, Federal Reserve Bldg., Cleveland, before June 23.

With a main steel frame building containing 27,522 sq. ft., the site of the plant occupies 52,197 sq. ft. Plant equipment includes: annealing furnaces, modern machine tools and a 30-ton overhead traveling crane with a 50-ft. span having two 17-ton trolleys. The utilities embrace power and light, water main, sanitary and storm sewers, a gas-fired heating system with five Clow gas-steam radiators and four Reynor gas-unit heaters.

The interior of the main building and its exterior loading platform are served by the Wheeling & Lake Erie Railroad. Pennsylvania and B. & O. rail service within a mile of the plant is accessible over paved roads.

Authorize Use of Osmium

Washington

• • • **A broadening of the permissive** uses of osmium metal, through amendment of order M302, has been announced by the WPB. Osmium, which is in the platinum group of metals, was previously restricted to implements of war except for osmium alloys manufactured or alloyed prior to April 16, 1943.

The new order permits consumers to use in any calendar quarter up to 12½ per cent of the amount they used in the year 1941, without restrictions as to when the osmium was alloyed.

Add Revocation Orders

Washington

• • • M-339—Limited amounts of copper and zinc used in printing plates. Delivery and use of the metals remain subject to WPB Order M-11-b and CMP regulations. M-11-b controls use of slab zinc by rollers and polishers of zinc sheets and CMP regulations continue to govern allocation of copper for all purposes.

M-126 — Curtailed and prohibited use of iron and steel in specified items. Controls of stainless steel formerly exercised through M-126 and other limitation and conservation orders have been maintained through the issuance of Direction 2 to M-21.

L-226—Controlled production and delivery of printing trade machinery. WPB estimates that it probably will be eight or nine months before items that have been completely out of production will be available.

L-199 — Controlled manufacture of range boilers and hot water storage tanks. Production and distribution of these items still subject to other applicable orders and regulations.

L-39 — Controlled production and distribution of fire protective, signal and alarm equipment.

L-250—Covering electric motor controllers.

L-221—Covering electric motors and generators.

L-315 — Covering enclosed safety switches, enclosed branch and service circuit breakers, service entrance equipment, panel and distribution boards and knife switches.

L-273—Covering busways.

M-110 — Required reports on monthly sales of molybdenum over 2000-lb. Reports will continue to be required under M-21 until supply situation eases.

L-30-b—Restricted use of iron and steel to make 24 household articles.

L-52 — Restricted production of bicycles.

L-107 — Limited delivery of light-weight extended surface heating equipment to approved orders bearing preference ratings of AA-5 or better and specific delivery dates.

L-101—Restricted the production and delivery of street cars, trolley cars, integral buses and bus bodies.

L-48—Restricted the transfer and manufacture of civilian aircraft. P-47-A issued, prescribing conditions under which civilian transport aircraft may be manufactured and delivered to United States air carriers.

European Transport Systems Serving Only Military Must Needs

Washington

• • • "Rehabilitation of the inland transportation system of Europe is the work of a generation," according to Maj. Gen. Frank I. Ross, Chief of Transportation in the European Theater of Operations since 1942. Back in this country for a short stay the General will soon return to Europe continuing his attempts to straighten out the transportation system of that war-torn continent.

The most critical need in Europe today is rolling stock, terminal facilities and warehousing, the General told a press conference on May 23. The General also pointed out that it will be six to eight months before the inland transportation system can even provide the bare necessities of life to the peoples of Western Europe.

Railroad transportation in France is under a pool arrangement. The United States Army has landed about 35,000 cars on the continent and while these cars are used to haul supplies to American units, on their return trips they supply the French civilian economy. American forces also use French cars under the pool system, but they have never used more than approximately 20,000 cars. Actually the American armies have been little burden to the domestic transport systems and have in many cases eased difficult civilian situations.

In prewar France there were about 450,000 freight cars. An inventory taken last fall showed that about 225,000 of these were still in existence and about 160,000 were in operating condition at that time. Since then the French have repaired practically all of those which were not in operating condition at the time the inventory was made, according to the General.

None of the American cars or locomotives will be removed from Europe, according to General Ross. This equipment is not standard to American railroads and is much lighter in all respects. For example, the average locomotive brought to Europe by the Army is only 35 per cent of the weight and size of any standard American locomotive. In the General's opinion, none of this equipment would be worth moving to the Pacific, since it would not be able to stand the process of disassembly, packing and reassembly at another location. Its average life is only from 3 to 4 years.

Little information is available on what will be required to put the German transportation system back on its feet, but the General said that a survey is underway and some definite information should be ready within the next 60 days. However, it is the intent of the Army to put the German people to work on this rehabilitation program as soon as they are capable of doing so, under American supervision. The General also felt that the German economy would be able to contribute much in the way of materials once present industrial surveys are completed.

Although railroad equipment will not be brought back from Europe, nor sent to the Pacific, it is expected that large numbers of trucks will be returned as part of the equipment of troops that are being moved.

In regard to water transport, General Ross said that in his opinion the Rhine would not be free for navigation until late fall. This also applies to other rivers and canals that were in the path of the Allied armies.

Finally, it is expected that transportation in ETO will remain at peak levels and may possibly increase because of civilian needs, until the redeployment of the armies is completed. Only then will the Transportation Corps be scaled down to the size required for an army of occupation.

Metal Powder Group Opposes Tariff Act

New York

• • • **The Metal Powder Association,** representing 21 producers of metal powders, has filed a brief with the House Ways and Means Committee in opposition to the present form of the bill to extend the Reciprocal Trade Agreements Act. The brief emphasized that the rates established by the Tariff Act of 1930 are essential to the growth of this young industry, and that the new bill might reduce some metal powder tariff schedules to as low as 25 per cent of those rates, since some have already been cut by existing agreements.

Hergenroether Resigns WPB

Washington

• • • **E. J. Hergenroether,** chief of the WPB Steel Division Metallurgical Branch, resigned June 1 to return to the International Nickel Co., Inc. Mr. Hergenroether will be succeeded by T. H. Halvorson, American Steel and Wire Co., executive.

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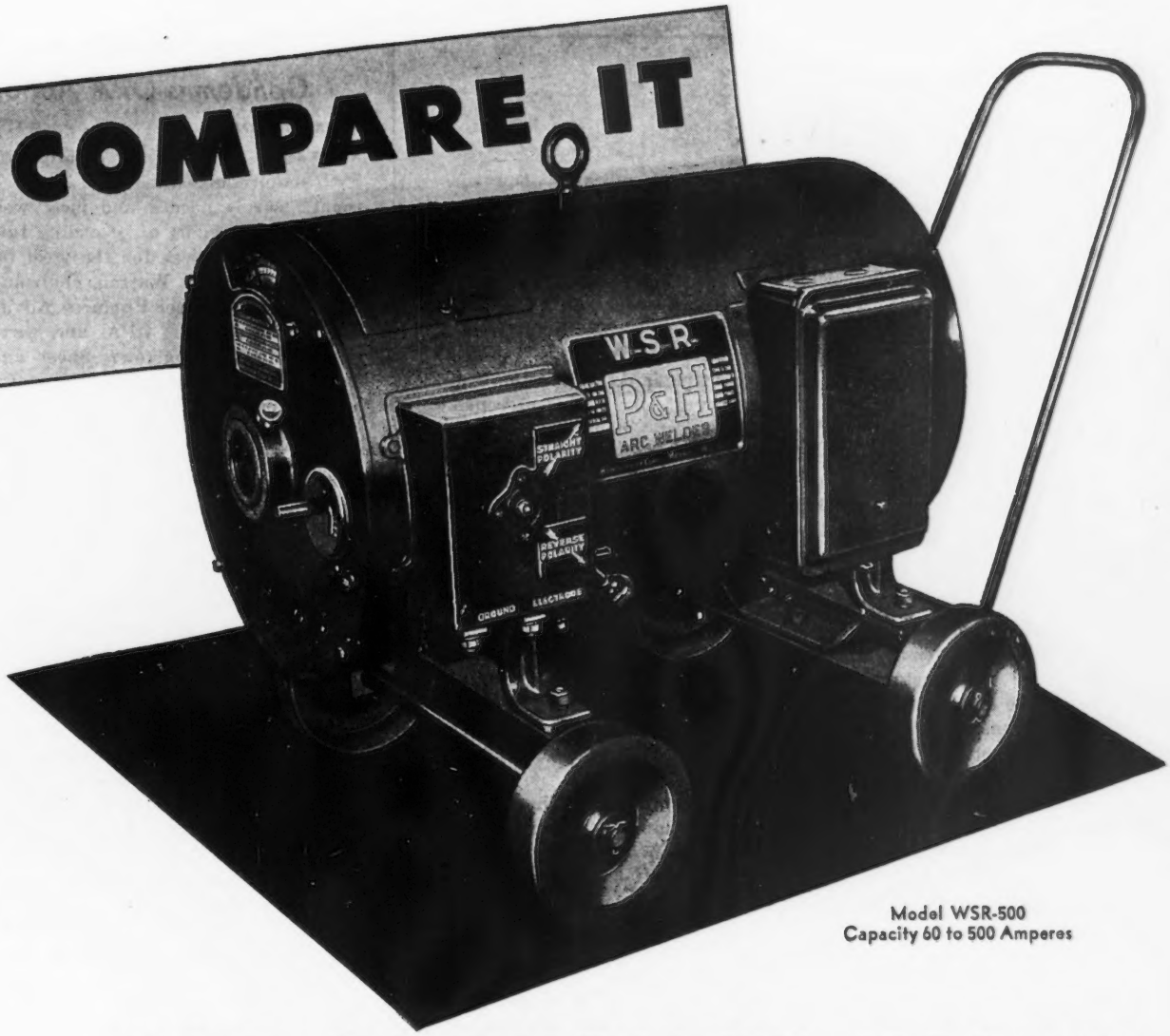

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Industrial Briefs . . .

• MAJOR EXPANSION—E. I. du Pont de Nemours & Co. recently announced an application to the War Production Board for a major expansion at the cellophane plant in Clinton, Iowa. The expansion program, if approved by WPB, would require about a year to complete.

• BUYS MACHINE TOOLS—The Moraine Products Division of General Motors Corp. has purchased approximately $275,000 worth of machine tools from Defense Plant Corp., with which to equip its plant for the resumption of civilian goods production. GM sources indicated they have no interest in entering the machine tool manufacturing field beyond the extent of their present involvement, which consists of manufacturing occasional special pieces of equipment which the company finds itself more qualified to produce than its normal suppliers.

• CORROSION RESEARCH—Causes of corrosion in the rods, tubing, and cylinders of Pennsylvania oil wells are being studied at Battelle Institute, Columbus, Ohio, in a program of research initiated for the Pennsylvania Grade Crude Oil Association. The research, which is aimed at the determination of corrosion prevention methods, is directed particularly toward the study of corrosion in air-gas secondary recovery operations in the Pennsylvania grade region. The program calls for both laboratory investigations in the Battelle laboratories and field tests at the producing wells.

• PLANT EXPANSION — Durez Plastics & Chemicals, Inc., is planning a $3,000,000 plant expansion program at North Tonawanda, near Buffalo, after the war, according to Harry D. Dent, president and chairman of the board. The company has purchased 27 acres of land adjacent to its present facilities there and will erect four new buildings. A substantial part of the expenditures, however, will consist of modernization of present equipment and greater mechanization. Mr. Dent said working forces also would be increased.

• HONORARY DEGREE — For the third time in its history the University of Omaha recently presented an honorary degree, when it bestowed upon Glenn L. Martin, president of The Glenn L. Martin Co. and chairman of the board of the Martin-Nebraska Co., the degree of Doctor of Science, in recognition of "his outstanding achievement in the application of scientific research, his international reputation in aeronautical engineering and his public services to this country and the world at large."

• NEW FOUNDRY — The Northern Aluminum Foundry Co. has been organized at North Fond du Lac, Wis., by S. F. Frankel, Gilbert E. Brach, and Richard Callender.

• NEW WAREHOUSE—The Carpenter Steel Co., Reading, Pa., has announced the opening of its new Cincinnati, Ohio, warehouse, located at 5137 Vine Street, St. Bernard. The warehouse will help the company better meet the demands for its tool, stainless and alloy steels required in the war program and for reconversion.

• GOVERNMENT APPOINTEE—Dr. Donald D. Kennedy has resigned his position as assistant general manager at Farrell-Cheek Steel Co. to accept appointment as chief of the Commodities Division, Department of State, under Mr. W. L. Clayton, assistant secretary.

• PLANT ADDITION — L. Hardy Co., Worcester, Mass., plans a one-story, 60 x 180 ft. plant addition after the war. It will permit completion of forging work on one level, facilitating production.

Steel Price Official Condemns OPA Action

Washington

• • • **Price increases for** certain carbon steel products announced by OPA, though sorely needed and most welcome, fall far short of providing fair and equitable prices for the steel industry, Walter E. Watson, chairman of the General Steel Products Advisory Committee of OPA and vice-president of Youngstown Sheet and Tube Co., stated recently. His statement in part follows:

"Despite operations at the highest level in history, the steel industry is losing money on a very large percentage of its business, whether measured in terms of tonnage or sales dollars. This loss is occurring in the items constituting the bulk of the normal production of the steel companies, including billets, slabs, hot rolled bars, hot rolled sheets, plates, skelp, rails, tube rounds, wire rods, wire and many wire products.

"The price increases fail to give any recognition to the retroactive feature of the heavy wage increases imposed on the industry by the War Labor Board. Even reimbursement for a substantial portion of the wage increases currently accruing was omitted; furthermore, no recognition is given to cutbacks in steel production and the expected swing from war specialties, on which there is a reasonable profit, to the bread-and-butter items largely produced at a loss.

"On a wholly unrealistic basis of figuring which completely disregards the fact that steel companies have to pay federal taxes before there are any profits left for owners, the OPA arrives at the conclusion that the industry now is earning as much as the average of the years 1936 to 1939. That, of course, is an erroneous conclusion. After taxes, the industry has substantially less money left to it than in that period despite its current capacity operations.

"OPA is raising ceiling prices on products now being sold at a loss, but to an extent which will recover less than bare average manufacturing costs, exclusive of sales and administrative expenses. Consequently, the new ceiling prices provide no profit, and not even the recovery of full costs on the large percentage of the production of the steel industry.

"In spite of doubling in sales and production, OPA takes the view that the industry should not complain unless its total dollar earnings are less than in the period 1936 to 1939."

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for uniformly sound alloy steels

If your products can be improved by alloy steels of uniform soundness . . . if your production losses can be reduced by cutting rejects due to faulty steel . . . Follansbee Pre-Forged Alloy Steels merit your consideration.

Follansbee ingots are first forged—then rolled—into blooms or billets. This exclusive process exerts a kneading action to the very center of the ingot, imparting a uniform density and grain structure which is preserved in subsequent working operations. Follansbee Pre-Forged Alloy Steels have proved their worth in countless products requiring the finest of steels—such as transmission gears and axles for heavy trucks and bulldozers, landing struts and propeller hubs for giant aircraft. They can be relied upon to meet the highest standards, *shipment after shipment.*

You are invited to test Follansbee Pre-Forged Alloy Steels in your products. Write, wire or telephone the General Offices or the nearest District Sales Office or Agency.

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Sales Offices—New York, Philadelphia, Rochester, Cleveland, Detroit, Milwaukee. *Sales Agents*—Chicago, Indianapolis, Houston, St. Louis, Nashville, Los Angeles, San Francisco, Seattle; Toronto and Montreal, Canada. *Plants*—Follansbee, W. Va. and Toronto, O.

ALLOY BLOOMS & BILLETS, SHEETS & STRIP • CLAD METALS • COLD ROLLED CARBON SHEETS & STRIP
POLISHED BLUE SHEETS • ELECTRICAL SHEETS & STRIP • SEAMLESS TERNE ROLL ROOFING

NWLB States Procedure For Arbitrations Of Disciplinary Discharge

Washington

• • • **Chairman George W. Taylor** of the National War Labor Board has announced adoption of a statement of principles on disciplinary discharges occurring in the ordinary course of plant operations, which principles the Board said it found were best suited to protect the respective functions of management and unions and the paramount interest of the public in maintaining continuous war production. Public, labor and industry members of the Board concurred unanimously.

The statement, clarifying the Board's policy and procedure applicable to labor disputes concerning disciplinary discharges and suspensions follows.

"Recent cases have demonstrated the need for clarification of some aspects of Board policy and procedure applicable to labor disputes concerning disciplinary discharges or suspensions, alleged to be without just cause. Ordinarily such disputes are finally determined by the use of established grievance procedures under labor agreements. In some agreements the grievance procedure may be defective and provide no means of finally resolving such disputes. When such an unresolved dispute is certified by the Secretary of Labor to the NWLB in accordance with the War Labor Disputes Act, it becomes the duty of the Board to make a final disposition of the case. In some instances, a case of this type is related to an unauthorized stoppage of work, which must be discontinued before the Board will consider questions arising out of disciplinary action by the employer.

"The Board's position with respect to discharges occurring during a strike is now well established. In such situations, as a necessary consequence of its consistent policy of maintaining the status quo, the Board will, as a general rule, order reinstatement of the discharged employees. If disciplinary action should subsequently be taken by management, which does not constitute a circumvention of the order of reinstatement, any dispute concerning such action may be taken up as a grievance, and, if necessary, submitted to arbitration. The foregoing procedure will control in the absence of special circumstances.

"The immediate problem is therefore confined to discharges occurring

in the ordinary course of plant oper tions. Such discharges, especial when union stewards or other offici are involved, sometimes give rise to feeling among the employees th management is attempting to unde mine the collective bargaining stat of the union. On the other hand cha lenges to management's right of di cipline may give rise to a feeling the part of management that the uni is attempting to undermine its fun tion of maintaining necessary pla discipline. The situation is often a gravated by lack of adequate contra procedure for speedy and final di position of grievances and uncertain as to the exact status of the di charged or suspended employees wh the grievance is being processed.

"On the basis of its experience these situations, the Board h adopted the following principles, best suited to protect the respecti functions of management and uni and the paramount interest of t public in maintaining continuous w production.

"1. A disciplinary suspension discharge alleged to be without ju cause should be taken up as a gri ance and finally determined under t grievance procedure as speedily possible. If an existing multist grievance procedure has been fou to be not adapted to the speedy pr essing of such grievances, a spec shortened procedure should be est lished for this purpose. Rapid dis sition of grievances concerning d ciplinary actions of management essential to orderly industrial re tions.

"2. Grievances which cannot be s tled by negotiation should be promp submitted to an arbitrator or um for final and binding decision, w power to order reinstatement back pay in appropriate cases. In cordance with its previously nounced general policy, when disci nary cases are certified to the Boa the Board will ordinarily direct a tration as a terminal point in grievance procedure, where not ready provided.

"3. Management has the right, the absence of agreement to the trary to direct a discharged or s pended employee to remain away f work until the grievance has b finally determined. A reasonable portunity should be provided for employee, before leaving the premi to report the details of his grieva


WHERE THERE'S TOUGH WEAR
THIS IS THE RACO WAY—
RACOLLOY MANGANESE
AUSTENITIC MANGANESE STEEL ELECTRODES
RACOLLOY Manganese heavily coated steel electrodes are used for repairing broken or worn austenitic 14% manganese steel parts and for applying deposits of manganese on mild steel.
The deposits are equal in toughness, wear-resistance and work hardening capacity to cast or wrought manganese steel. Moreover, since these electrodes contain nickel to prevent brittleness, the deposits withstand severe shock.
Among the applications for RACOLLOY Manganese are rock crusher jaws, pumps, dredge buckets, railway frogs and similar spots subject to rough treatment.
OTHER RACO HARD SURFACING ELECTRODES:
RACO 25—Heavily coated; for building up worn parts and surfaces on which a tough machinable deposit of moderate hardness is needed.
RACO 45—Heavily coated; for surfaces that require no machining, but must withstand severe wear and abrasion.
RACO 55—Heavily coated; for building up surface of extreme hardness and wear-resistance.
★
These electrodes are identical with all RACO products—precision made and of best materials to give finest performance.
The REID-AVERY COMPANY
INCORPORATED
DUNDALK • BALTIMORE 22 • MARYLAND
SINCE 1919 PRODUCERS OF ARC WELDING ELECTRODES AND WELDING RODS

to the union official authorized to present it.

"4. The Board does not suggest, and will not direct, changes in procedures heretofore established by agreement or practice, which the parties regard as adequate to meet the problems under consideration. In the absence of such procedures, however, the Board and its agencies will, as a rule, follow the principles outlined above.

"5. The National and the Regional War Labor Boards will make available to the parties lists of persons specially qualified to act as arbitrators or umpires in cases of this nature."

WMC Regional Directors Delegated Authority For 48 hr. Work-Week

Washington

• • • **Permissive authority** to retain or revoke the 48 hr. work-week in 28 areas where formerly a work-week of this length has been mandatory was delegated on May 17 to WMC regional directors by WMC Chairman Paul V. McNutt.

Mr. McNutt explained that his action is a formality that placed the areas involved on the same basis as all other areas in the country in so far as authority of regional directors to retain or revoke the 48 hr. work-week is concerned.

In instituting the longer work-week in areas where manpower shortages were acute in February, 1943, Mr. McNutt originally designated certain areas as subject to the regulation and simultaneously authorized the regional directors to apply or rescind the regulation in additional areas. Under the amendment the regional director's authority is extended to include retention or rescission of the 48-hr. work-week in the 28 areas previously designated by the chairman as is true of all other labor market areas.

The 28 areas involved are: Akron, Ohio; Baltimore; Bath, Me.; Beaumont, Tex.; Bridgeport, Conn.; Buffalo; Charleston, S. C.; Cheyenne, Wyo.; Dayton, Ohio; Detroit; Elkton, Md.; Hampton Roads, Va.; Hartford, Conn.; Las Vegas, Nev.; Macon Ga.; Mobile, Ala.; New Britain, Conn.; Ogden, Utah; Pascagoula, Miss.; Portland, Ore.; Portsmouth, N. H.; San Diego, Calif.; Seattle, Wash.; Somerville, N. J.; Springfield, Mass.; Sterling, Ill.; Washington, D. C.; Waterbury, Conn.

SUN DIESEL LUBRICANT . . .

Keeps Overloaded Diesel in Top Shape, Ends Stuck Rings, Cuts Carbon by 60%

When a Diesel engine is overloaded continuously, it provides the toughest kind of testing-ground for lubricants. War-time requirements kept a manufacturer's Diesel operating at constant overload.

Top rings stuck, usually within two or three months, and exhaust-ports were constantly getting clogged with carbon. Three lubricating oils, furnished by different, well-known suppliers, all gave the same results, had to be changed four times a year.

To end the plague of ring-sticking and carbon, the management called in a Sun Engineer, who recommended a Solnus Oil, especially refined to stand up under long periods of high-temperature Diesel operation.

After one solid year with the Solnus Oil, maintenance reports showed carbon had been reduced from 50 to 60 per cent. There had been no stuck rings at all. Oil consumption had been reduced 25 per cent.

For small, high-speed Diesels, or for large stationary types, Sun makes a complete line of lubricants that stand the test of hard service. Continued research, to match the continued and rapid development of Diesel power, keeps these lubricants abreast of modern engine requirements. For full information, call the Sun Engineer near you. Or write to

SUN OIL COMPANY • ***Philadelphia 3, Pa.***

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SUNOCO **SUN INDUSTRIAL PRODUCTS**

OILS FOR AMERICAN INDUSTRY

WPB to Keep Controls Over 19 Construction Machinery Products

Washington

• • • **Continued WPB control** over 19 items of construction machinery that are expected to remain scarce is provided in an amended order which completely revised the former L-192. The order eliminated production scheduling and substituted List 1 with 14 items, for the former Schedules A and B, which contained 98 items that were under production and distribution control.

Up to 75 per cent of each producer's monthly output of each model of the items covered by the order is reserved for the military. No distribution control was imposed on the remainder of monthly production of the items on List 1 and they may be sold without restriction. For items on List 2, however, specific WPB authorization is required for the sale of the remainder of monthly output. Application for authorization is made on Form WPB-1319 and is filed in the nearest WPB field office.

If less than 75 per cent of production of a particular item is required by the military agencies during any month, the portion not required may be shipped to other persons, within the provisions controlling sale of List 2 items. A producer may deliver more than 75 per cent of any model to military agencies during any month, but is not required to do so unless more than 75 per cent is called for by contracts with a military agency, entered into before May 17.

Repair parts are also apportioned to take care of military needs. When a producers's unfilled orders for a particular part exceed his inventory of that part, he is required to reserve up to 75 per cent of his total deliveries of the part for the military. When this condition no longer exists for a particular part, this restriction on delivery is lifted. Producers are required to file monthly reports (Form WPB-1689) on production, shipments and unfilled orders on or before the 15th of each month. Military agencies as defined in L-192 are the Army, Navy, Maritime Commission, War Shipping Administration and Veterans Administration.

Items on List 1: Angledozers, bulldozers and modifications; cranes, attachments for tractor mounting; crushing plants, portable type;

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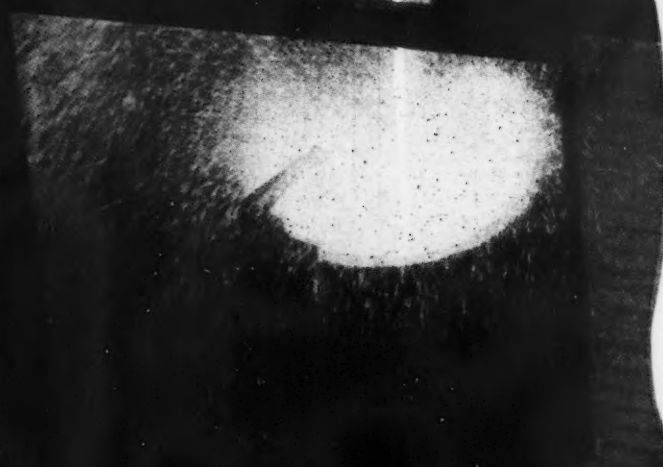
Lectromelt

THE FURNACE OF TODAY AND TOMORROW

A size "NT" Lectromelt top-charge type furnace for pouring heats of 15 to 20 tons.



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FURNACES

FOR MELTING QUALITY STEELS AND IRONS

With an outstanding record of a war job well done, Lectromelt top-charge furnaces are ready for long and efficient peacetime service. Consult Lectromelt's engineers for complete details regarding your melting problems.

TOP CHARGE LECTROMELTS RANGE FROM 100 TONS DOWN TO 250 POUNDS.

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PITTSBURGH 30, PENNA.

ditchers, ladder and wheel types; distributors, bituminous; finishers, paving, bituminous.

Leaders, portable bucket (other than drag, flight or scraper type coal conveyors); plants, asphalt, including travel mix type; power control units, attachments for tractor mounting (both cable and hydraulic); pumps portable engine or electric-motor-driven pumping units, mounted on skids, with or without handles, or trailer mounted); self-priming centrifugal pumps, horizontal or vertical triplex piston road pumps; ordinarily used for contractor's purposes or by contractors for dewatering and supply; rollers, road, portable, tandem and three-wheeled types; scrapers, carrying and hauling, self-propelled; shovels, attachments for tractor mounting; winches, attachments for tractor mounting.

Items on List 2: Cranes, crawler and rubbertired mounted power and modifications thereof, except freight handling lift trucks; draglines, walking type (other types—see cranes); graders, self-propelled, earth moving type; shovels, crawler and rubbertired mounted power and modifications thereof; tractors, tracklaying type.

Government Takes Plate Mill

Toronto

• • • Arthur Cross, President of Dominion Steel and Coal Corp., stated that negotiations now are underway for the transfer of the company's plate mill at Sydney, N. S., to government ownership, effective as of December 31, 1944. This plant was rehabilitated during the war to provide plate for Canada's wartime shipping program.

Mr. Cross further stated that the high level of operations at the plant of the corporation is expected to continue through 1945, due to the demand for the Japanese war and for domestic equipment. Directors are giving increasing attention to possibilities of export business and to consolidating and improving operations in the Montreal area. Under an agreement with the government he pointed out that government subsidy aid for the Sydney steel plant is being provided as from January 1, 1945, on the basis of tonnage of ingots produced instead of an operating basis.

PRECISION BENDING with PINES *Automatic* BENDERS

Heavy Duty Construction

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Bending rectangular wave guide Radar tubes to extremely close tolerances. Automatic push-button control, angle-of-bend selector, booster attachment, adjustable mandrel rod stops, streamlined design—are exclusive Pines Bender features, found in no other equipment.

PINES *Automatic* PROFILER

Single and double spindle. Burr, bore, face, center, thread, turn, drill, ream, chamfer one or both ends of tubes and rods.

PINES *Automatic* CUT-OFF

Rotary, friction wheel, abrasive types.

LOOK TO PINES TO *COMPLETELY* TOOL PLANTS FOR TUBE FABRICATION!

LET US ANALYZE YOUR POST-WAR TUBE FABRICATING PROBLEM

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SPECIALISTS IN TUBE FABRICATING EQUIPMENT

Canadian Controls Again Relaxed As Cutbacks Reappear

Toronto

• • • Canada has started to drop some of its control regulations with regard to raw materials and the go-ahead signal is being given to a number of industries to return to peace-time manufacturing activities. Despite relaxation of some restriction controls it is not likely that Canadian consumers will start to reap benefit in the way of increased supply of household equipment and other commodities until the early part of 1946 largely due to the fact that certain components that must come from the United States are not expected to become available in the immediate future.

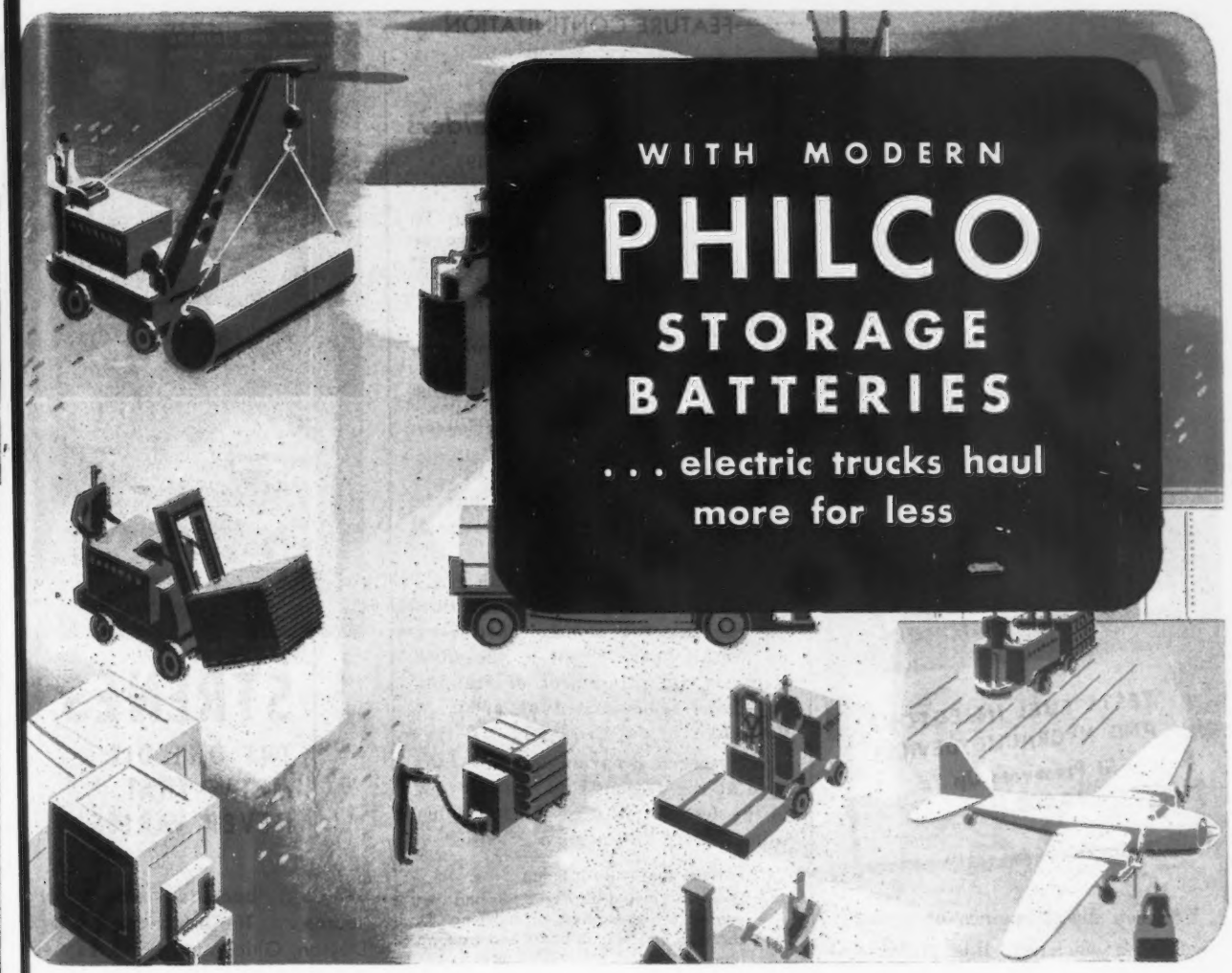
Insofar as steel and metals are concerned there will be a favorable improvement in supply to non-war consumers within the next couple of months. Already a number of companies are prepared to enter civilian production on a more elaborate scale as they have for some time been engaged in swinging over from war to peace-time equipment. However, there are others, still engaged on war contracts, that will take several months to become firmly established in peace-time activities as many are faced with almost complete retooling.

The automotive industry is expected to get started before the end of the year, but first passenger cars to roll off assembly lines in Canada will be ear-marked for the essential users and it is not expected that the ordinary buyers will be able to obtain delivery of new cars for some months to come. At present it is stated there are only about 35 cars in the banks for essential requirements.

All restrictions on the manufacture, distributing, inventory stocking, and use of replacement parts and accessories for automotive vehicles have been removed. These restrictions first were put into effect in June, 1942.

Restrictions have been lifted to a large extent on the manufacture of electrical equipment for household use, as well as for the manufacture of all types of agricultural implements and farm equipment.

Announcement was made from Ottawa that United States war contracts in Canada will be cut back very quickly and ahead of similar cutbacks in the United States. Already substantial cancellations of United States' contracts with Canadian firms have been reported.

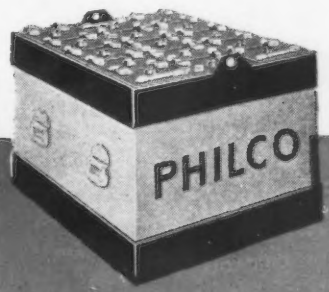


MORE THAN ever, today, Philco stands out as the leader in the development of modern high capacity, long-life storage batteries for electric industrial trucks. Well known to material handling men is the pioneering work of Philco with its famous XL and XVL type Batteries. And now, in addition, the great new Philco "Thirty" with 30% longer life, is available in increasing quantities for current deliveries. Powered by modern Philco Batteries, your electric trucks do more work. Philco dependability and longer life save you money. Write today for new descriptive catalogs. PHILCO CORPORATION, *Storage Battery Division,* Trenton 7, New Jersey.

For 50 years a Leader in Industrial Storage Battery Development

The New PHILCO "THIRTY"
with 30% longer life is identified by its distinctive red connectors.

Philco Motorized Hand-Lift Truck Battery



Typical Philco Electric Industrial Truck Battery in Steel Tray

Measuring Efficiency Of Training Welders

(CONTINUED FROM PAGE 49)

2. Nervous student
3. Insufficient training for specific student who requires more than average attention and time.

Condition 4. Low operating efficiency; other results good.

ANALYSIS: 1. Student should work harder, has ability
2. Instructor should keep student going uphill faster.

Condition 5. High operating efficiency; all results good.

ANALYSIS: More than satisfactory.

A complete analysis can thus be made to keep a close control on all students and instructors.

Results have been more than gratifying in the use of this system. During the first two months' operations, an overall improvement in the effectiveness and attainment of training objectives is estimated at about 30 per cent.

A research program is being pursued at the present time with a view to the determination of the following, using this control system:

1. Fatigue factors in training
2. Overall training pattern, plotting the course of absorption of learning by students against arc hours and training time
3. Ideal training time
4. Process of training according to sequence of presentation of units of training.

Such data will be published when results are obtained and correlated for a reasonable period of time.

The authors wish to extend their appreciation to the following for their untiring efforts and full cooperation in the use and application of this method of efficiency and production control of training personnel for manual arc welding: Geo. H. Davies, superintendent, weld training; C. Hoffman, assistant superintendent, weld training; C. Brandvold, assistant superintendent, weld training, and C. S. Kier, supervisor, electrode distribution.

E. E. Robbins Appointed

Washington

• • • PAW on May 23 announced the appointment of E. E. Robbins, Tulsa, Okla., as director of its Division of Materials. Mr. Robbins was formerly a special representative on petroleum materials for the U. S. Steel Export Co.

COMING LAWNMOWERS

Power lawn-mowers of tomorrow will combine real beauty with utility. Lawn-mowers are only one of the products that will be made more attractive and more readily useable, through the use of light alloys in substitution for much heavier metals. Aluminum and magnesium alloys combine lightness with great strength and will supply the answer to many problems in design. Consider Bohn as the source to which you can come for advice and assistance in helping plan your new products to meet post-war requirements.

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GENERAL OFFICES—LAFAYETTE BUILDING • DETROIT 26, MICHIGAN
Designers and Fabricators
ALUMINUM • MAGNESIUM • BRASS • AIRCRAFT-TYPE BEARINGS

Frank Di Benedetto,
blocker,
with J&L 12 years

John Morgan,
galvanizer,
with J&L 9 years

Wire galvanizing unit

FROM AN ORIGINAL DRAWING AND SKETCHES MADE AT J&L ALIQUIPPA WORKS BY ORISON MACPHERSON

MACHINE TOOLS

. . . News and Market Activities

Centralized Tool Inventory Promised

Cleveland

Caught in the gears of a powerful war machine now engaged simultaneously in the painful task of plowing under the Japanese empire and exploring the road to reconversion, the machine tool industry has reached an impasse. Cutbacks in the munitions program, while trifling in size as yet, are widespread and certainly harbingers of the really loud repercussions to come. According to the current report of the Tools Division of the War Production Board, it will take the industry seven months to catch up with orders on hand as of the end of April, but at the same time munitions makers, some 300 of them throughout the nation, are waiting to learn the result of the meetings held on munitions production. Either cutbacks have been slow in reaching the industry or they are willingly contributing to a problem that has long since been at hand and one whose magnitude should not be engendered further.

At this moment, the government holds a quasi-monopoly on the newest and best machine tools in the country, most of them part of a potential surplus which mounts monthly and to which April machine tool shipments, valued at $4,331,000, will be another contribution in the final scoring.

Last month, a hearing was held in Washington before Senator Stewart (D., Tenn.) and his Surplus Property Subcommittee, at which industry, labor and government representatives alternately testified and listened. Out of that session came a bill introduced by Senator Stewart to make the taking of a central inventory mandatory and by introducing this bill the Senator attacked what is widely regarded as the core and very essence of our machine tool surplus and its consequent disposal problems.

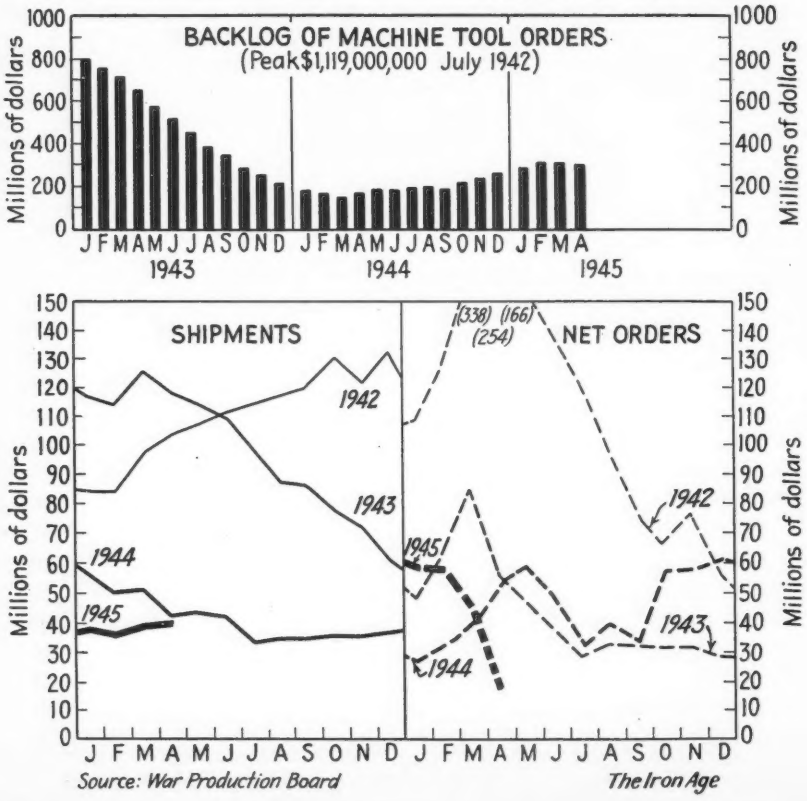
But this central inventory, a most logical adjunct to our war production and postwar productive effort as well, will scarcely arrive in anything approaching the nick of time, if and when it does come.

In the meantime, the Reconstruction Finance Corp. has been given the sole disposition of machine tools, including those from the services and the Army pool machines, but even so, they are not going to take a central inventory right now. However, an inventory will be taken on those machines that become surplus and this will eventually emerge before Mr. John Q. Public in the form of a catalog listing. The powers that be have finally succeeded in getting the services to agree on a national pool of idle machines.

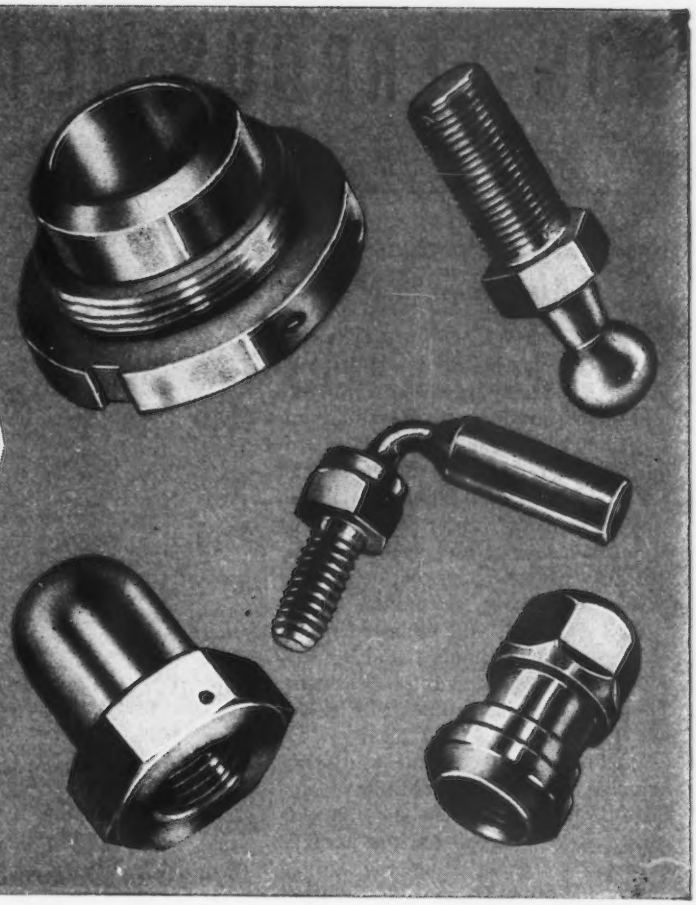
This inventory, but preferably a central one, should have been taken months ago. Machines are being sold right now that have never been taken from their skids while the machine tool industry keeps producing more and more new machine tools which will inevitably become a surplus problem and a problem which may easily be more than some members of that industry can stand.

Little or no serious effort has been made by the various government agencies to determine as closely as possible what will be purchased when the war is over. This shortcoming has been emphasized by the plans of Orrin Werntz, executive secretary, National Screw Machine Product Association, to survey the market and obtain some concrete notion of industry's plans for purchase. The association will soon send questionnaires to 1000 companies to determine not only the pool of requirements in the screw machine products industry including makes, models and sizes, but the number of machines the companies intend to scrap as well. This survey will provide a starting point for government agencies and if made available, some interesting statistics to machine tool builders also.

• Machine tool shipments in April were valued at $40,331,000, an increase of seven-tenths of one per cent over March, according to a preliminary report issued by the WPB Tools Division. Unfilled orders decreased to $287,920,000 or 7 per cent from March. At the current rate of shipment, however, WPB estimates it will take the industry seven months to catch up with orders on hand as of the end of April. The value of new net orders received was $17,603,000 or a decrease of $30,011,000 compared with the previous month. The report also shows that manpower in the industry decreased one per cent during April to a total of 55,800. As compared with April, 1944, however, the number of wage earners in the industry has decreased by 12,800, or 19 per cent.



Need Parts Like These?

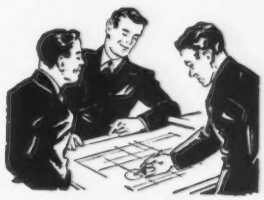


Come to Tourek

These are typical precision screw machine products. Tourek can make them *exactly to your specifications* . . . in any size from 1/16" to 2 5/8". . . in any metal . . . in any quantity. Here at Tourek to supply these custom products is an organization coordinated to serve. An organization complete and modern in *equipment* . . . ingenious in *engineering "know-how"*. . . and rich in manufacturing *experience.*

Although present production demands are today engaging our facilities, we are eager to serve you. Why not consult us—particularly on your postwar screw machine products problems?

TOUREK'S EQUIPMENT
Tourek's modern plant is equipped with the latest model automatic screw machines, all necessary supplementary equipment and complete tool room facilities.



TOUREK'S INGENUITY
Tourek's Engineering Staff works closely with you to devise the most effective design and economical production of precision parts.

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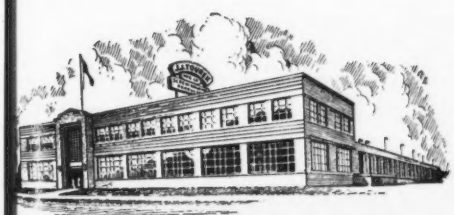

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TOUREK

PRECISION SCREW MACHINE PRODUCTS

NON-FERROUS METALS

. . . News and Market Activities

Reynolds to Produce Aluminum in Mexico

New York

• • • **Reynolds Metals Co.** will establish a subsidiary in Mexico for the immediate production of aluminum sheet and plate, and foils made of aluminum, lead and tin. Later on the company, Reynolds Internacionale de Mexico, expects to enter other fields of aluminum fabrication, such as forgings, extrusions, bars, rod, cable, and powder and paste for paints.

R. S. Reynolds will be board chairman of the new company and his son, J. Louis Reynolds, will be president. The manager of the plant will be Edwin Taranger.

Machinery and equipment is being shipped from the United States for installation as soon as the plant is constructed. Bauxite for the plant is expected to come from the United States and from Jamaica, where what is said to be the most extensive ore deposit in the world is located. Reynolds Mining Co., another subsidiary, recently obtained a concession from the Haitian Government for ore deposits in that country.

Ceiling for Scrapped Forming, Stamping Dies

Washington

• • • **A maximum price** of 4.95c. per lb. fob. point of shipment for zinc base forming and stamping dies sold as scrap has been established by the OPA in an amendment to MPR 3 effective May 31.

A quantity premium of 5½c. per lb. is permitted on shipments of 20,000 lb. or more of the new grade.

Molybdenum Reports Required

Washington

• • • **Because of the recent expansion** of authority of General Preference Order M21 to include steel alloying elements, the WPB has revoked order M110, which required reports on monthly sales of molybdenum over 2,000 lb. The molybdenum reports will continue to be required under order M21, WPB said, until such time as the molybdenum supply situation eases.

INGOT SHIPMENTS: *Ingot brass and bronze shipments in April dropped to* 40,118 *tons according to the Defense Council of the Ingot Brass and Bronze Industry.*

Tungsten Demands Easing Slightly

Washington

• • • **Reflecting a slight** easing in tungsten demands, WPB has postponed from June 1 to June 30, the date after which purchasers of high-speed tool steel must accept the greater proportion of their requirements in low-percentage tungsten steel. The order, made under amendment to M-21-j, requires that purchasers accept 85 per cent of their high speed tool steel requirements in Class A tool steel, containing not more than 6.75 per cent tungsten and only 15 per cent in Class B, containing more than 12 per cent tungsten.

Exempted from the provisions of the order by the amendment are deliveries of Class B high speed steel containing cobalt for use in the manufacture of tool holder bits.

Offers Electric Cable, Aluminum Stair Treads

Richmond, Va.

• • • **New electrical cable** containing one, two or three conductors is offered in catalog 114, RFC Surplus Property Division, Seventh and Main Sts., Richmond 19, Va.

Cast aluminum, ribbed or abrasive containing, stair treads are offered in catalog 105.

Lead Requirements Will Ease in June

New York

• • • **It is believed in the trade** that consumption of lead during June will be somewhat lower than May requirements. Moreover, a fair tonnage was added to the government stockpile of lead during June, principally as a result of the shipment of 10,000 tons which came in from Canada. Battery manufacturers continue to clamor for lead for use in the production of civilian storage batteries. On the other hand, military authorities have not yet established their program in detail for lead requirements in a one-front war.

The Bureau of Mines has reported a 24 per cent increase in the consumption of lead scrap during the month of March. The recoverable lead content of lead base scrap and residues rose from 22,900 tons in February to 29,426 tons in March. Its distribution into pig lead and fabricated products was in percentage approximately 54, antimonial lead; 21, soft lead; 10, solder; 8, bearing metals and 7, type metals.

Magnesium Shipments Continue Up in March

New York

• • • **Shipments of magnesium** products reached new highs in March according to statistics released by the Aluminum and Magnesium Div., WPB. Permanent mold castings totaled 683,000 lb., an increase of nearly 4 per cent since February. Die castings shipments in March increased by 30 per cent to a total of 281,000 lb. Sand casting shipments reached 6.7 million lb. during the month. Shipments of wrought magnesium products also increased appreciably in March with forgings totaling 28,000 lb., extrusions 277,000 lb. and aggregate shipments of sheet, strip and plate reaching 248,000 lb. These figures do not include incendiary bomb castings, extruded sheet stock, forging stock and sticks.

Primary magnesium production reached 6.66 million lb. during March and secondary metal recovery realized another 2.8 million lb.

Primary Metals

(Cents per lb., unless otherwise noted)

Aluminum, 99+%, del'd (Min. 10,000 lb.)	15.00
Antimony, American, Laredo, Tex.	14.50
Beryllium copper, 3.75-4.25% Be; dollars per lb. contained Be	$17.00
Cadmium, del'd	90.00
Cobalt, 97-99% (per lb.)	$1.50 to $1.57
Copper, electro, Conn. valley	12.00
Copper, electro, New York	11.75
Copper, lake	12.00
Gold, U. S. Treas., dollars per oz.	$35.00
Indium, 99.9%, dollars per troy oz.	$4.00
Iridium, dollars per troy oz.	$120.00
Lead, St. Louis	6.35
Lead, New York	6.50
Magnesium, 99.9 + %, carlots	20.50
Magnesium, 12-in. sticks, carlots	27.50
Mercury, dollars per 76-lb. flask, f.o.b. New York	$154.00 to $157.00
Nickel, electro	35.00
Palladium, dollars per troy oz.	$24.00
Platinum, dollars per oz.	$35.00
Silver, open market, New York, cents per oz.	44.75
Tin, Straits, New York	52.00
Zinc, East St. Louis	8.25
Zinc, New York	8.65

Remelted Metals

(Cents per lb. unless otherwise noted)

Aluminum, No. 12 Fdy. (No. 2)	9.00 to 10.00
Aluminum, deoxidizing No. 2, 3, 4	$6.00 to 9.50
Brass Ingot	
85-5-5-5 (No. 115)	13.25
88-10-2 (No. 215)	16.75
80-10-10 (No. 305)	16.00
No. 1 Yellow (No. 405)	10.25

Copper, Copper Base Alloys

(Mill base, cents per lb.)

	Extruded Shapes	Rods	Sheets
Copper	20.87	....	20.37
Copper, H.R.	....	17.37	....
Copper drawn	....	18.37	....
Low brass, 80%	....	20.40	20.15
High brass	....	....	19.48
Red brass, 85%	....	20.61	20.36
Naval brass	20.37	19.12	24.50
Brass, free cut	....	15.01	....
Commercial bronze, 90%	....	21.32	21.07
Commercial bronze, 95%	....	21.53	21.28
Manganese bronze	24.00	....	28.00
Phos. bronze, A, B, 5%	....	36.50	36.25
Muntz metal	20.12	18.87	22.75
Everdur, Herculoy, Olympic or equal	....	25.50	26.00
Nickel silver, 5%	....	28.75	26.50
Architect bronze	19.12	....	....

Aluminum

(Cents per lb., subject to extras on gage, size, temper, finish, factor number, etc.)

Tubing: 2 in. O.D. x 0.065 in. wall 2S, 40c. (½H); 52S, 61c. (O); 24S, 67½c. (T).

Plate: 0.250 in. and heavier; 2S and 3S, 21.2c.; 52s, 24.2c.; 61S, 22.8c.; 24S, 24.2c.

Flat Sheet: 0.188 in. thickness; 2S and 3S, 22.7c. a lb.; 52S, 26.2c.; 61S, 24.7c.; 24S, 26.7c.

2000-lb. base for tubing; 30,000-lb. base for plate, flat stock.

Extruded Shapes: "As extruded" temper; 2000-lb. base, 2S and 3S, factor No. 1 to 4, 25.5c.; 14S, factor No. 1 to 4, 35c.; 17S, factor No. 1 to 4, 31c.; 24S, factor No. 1 to 4, 34c.; 53S, factor No. 1 to 4, 23c.; 61S, factor No. 1 to 4, 28½c.

The factor is determined by dividing perimeter of shape by weight per lineal foot.

Wire Rod and Bar: Base price; 17ST and 11ST-3, screw machine stock. Rounds: ¼ in., 28½c. per lb.; ½ in., 26c.; 1 in., 24½c.; 2 in., 23c. Hexagonals: ¼ in., 34½c. per lb.; ½ in., 28½c.; 1 in., 25½c.; 2 in., 25½c. 2S, as fabricated, random or standard lengths, ¼ in., 24c. per lb.; ½ in., 25c.; 1 in., 24c.; 2 in., 23c. 24ST, rectangles and squares, random or standard lengths. 0.093-0.187 in. thick by 1.001-2.000 in. wide, 33c. per lb.; 0.751-1.500 in. thick by 2.001-4.000 in. wide, 29c.; 1.501-2.000 in. thick by 4.001-6.000 in. wide, 27½c.

Magnesium

Sheet, rod, tubes, bars, extruded shapes subject to individual quotations. Metal turnings: 100 lb. or more, 46c. a lb.; 25 to 90 lb., 56c.; less than 25 lb., 66c.

NONFERROUS SCRAP METAL QUOTATIONS

†*(OPA basic maximum prices, cents per lb., f.o.b. point of shipment, subject to quality, quantity and special preparation premiums—other prices are current quotations)*

Copper, Copper Base Alloys

OPA Group 1†

No. 1 wire, No. 1 heavy copper	9.75
No. 1 tinned copper wire, No. 1 tinned heavy copper	9.75
No. 2 wire, mixed heavy copper	8.75
Copper tuyeres	8.75
Light copper	7.75
Copper borings	9.75
No. 2 copper borings	8.75
Lead covered copper wire, cable	6.00*
Lead covered telephone, power cable	6.04
Insulated copper	5.10*

OPA Group 2†

Bell metal	15.50
High grade bronze gears	13.25
High grade bronze solids	11.50*
Low lead bronze borings	11.50*
Babbitt lined brass bushings	13.00
High lead bronze solids	10.00*
High lead bronze borings	10.00*
Red trolley wheels	10.75
Tinny (phosphor bronze) borings	10.50
Tinny (phosphor bronze) solids	10.50
Copper-nickel solids and borings	9.25
Bronze paper mill wire cloth	9.50
Aluminum bronze solids	9.00
Soft red brass (No. 1 composition)	9.00
Soft red brass borings (No. 1)	9.00
Gilding metal turnings	8.50
Contaminated gilded metal solids	8.50
Unlined standard red car boxes	8.25
Lined standard red car boxes	7.75
Cocks and faucets	7.75
Mixed brass screens	7.75
Red brass breakage	7.50
Old nickel silver solids, borings	6.25
Copper lead solids, borings	6.25
Yellow brass castings	6.25
Automobile radiators	7.00
Zincy bronze borings	8.00
Zincy bronze solids	8.00

OPA Group 3†

Fired rifle shells	8.25
Brass pipe	7.50
Old rolled brass	7.00
Admiralty condenser tubes	7.50
Muntz metal condenser tubes	7.00
Plated brass sheet, pipe reflectors	6.50
Manganese bronze solids	7.35[1]
Manganese bronze solids	6.25[2]
Manganese bronze borings	6.50[1]
Manganese bronze borings	5.50[2]

OPA Group 4†

Refinery brass	4.75*

*Price varies with analysis. [1] Lead content 0.00 to 0.40 per cent. [2] Lead content 0.41 to 1.00 per cent.

Other Copper Alloys

Briquetted Cartridge Brass Turnings	8.625
Cartridge Brass Turnings, Loose	7.875
Loose Yellow Brass Trimmings	7.875

Aluminum

Plant scrap, segregated

2S solids	8.00
Dural alloys, solids 14, 17, 18, 24S 25S	5.00
turnings, dry basis	3.00
Low copper alloys 51, 52, 61, 63S solids	7.50
turnings, dry basis	5.75

Plant scrap, mixed

Solids	4.00
Turnings, dry basis	2.50

Obsolete scrap

Pure cable	8.00
Old sheet and utensils	6.00
Old castings and forgings	5.00
Pistons, free of struts	5.00
Pistons, with struts	3.00
Old alloy sheet	5.00

Magnesium*

Segregated plant scrap

Pure solids and all other solids, exempt	
Borings and turnings	1.50

Mixed, contaminated plant scrap

Grade 1 solids	3.00
Grade 1 borings and turnings	2.00
Grade 2 solids	2.00
Grade 2 borings and turnings	1.00

*Nominal.

Zinc

New zinc clippings, trimmings	6.50
Engravers, lithographers plates	6.50
Old zinc scrap	4.75
Unsweated zinc dross	5.00
Die cast slab	4.50
New die cast scrap	4.45
Radiator grilles, old and new	3.50
Old die cast scrap	3.00

Lead

Deduct 0.55c. a lb. from refined metal basing point prices or soft and hard lead including cable, for f.o.b. point of shipment price.

Nickel

Ni content 98+%, Cu under ½%, 26c. per lb.; 90 to 98% Ni, 26c. per lb contained Ni.

ELECTROPLATING ANODES AND CHEMICALS

Anodes

(Cents per lb., f.o.b. shipping point in 500 lb lots)

Copper, frt. allowed	
Cast, oval, 15 in. or longer	25⅛
Electrodeposited	18⅞
Rolled, oval, straight	19¼
Curved	20⅜
Brass, 80-20, frt. allowed	
Cast, oval, 15 in. or longer	23⅝
Zinc, cast, 99.99, 15 in. or longer	16¼
Nickel, 99 per cent plus, frt. allowed	
Cast	47
Rolled, depolarized	48
Silver, 999 fine	
Rolled, 1-9 troy oz., per oz.	58*

Chemicals

(Cents per lb., f.o.b. shipping point)

Copper cyanide, 1-5 bbls.	34.00
Copper sulphate, 99.5, crystals, bbls.	7.75
Nickel salts, single, 425 lb. bbls., frt. allowed	13.50
Silver cyanide, 100 oz. lots	—.4179
Sodium cyanide, 96 per cent, domestic, 100 lb. drums	15.00
Zinc cyanide, 100 lb. drums	33.00
Zinc sulphate, 89 per cent, crystals, bbls., frt. allowed	6.35

*Price based on use of foreign silver.

SCRAP

. . . News and Market Activities

Open Hearth and Blast Furnace Firm

New York

• • • **Heavy grades of open hearth scrap continues strong this week with Pittsburgh mills buying heavily in New York, Chicago and Philadelphia, and thereby tending to support the market throughout the country. Apparently the effort of a leading consumer to drop the going price for open hearth grades has not been successful, and there is some indication from dealers that this consumer may not be obtaining scrap supplies at the prices offered.**

The turnings market, which has been dropping steadily during the past several months, seems to have reached a point of stabilization at which adequate supplies are assured at a constant price. Predictions from Pittsburgh that shell production cutbacks would likely develop into a shortage of low phos and turnings have not yet materialized. Cleveland reports that because of a $4.00 spread between machine shop turnings and short shoveling turnings dealers are culling out the short turnings but that consumers of machine shop will not buy these culled turnings. Nevertheless turnings are reported to be short there.

Earlier hesitation on the part of all factors in the industry seems to have disappeared with the consistent buying of certain western Pennsylvania mills who are willing to pay transportation charges for long distance hauls from the East. This would not have been practical last year when the spring board was being maintained by the OPA.

Cast grades of scrap are reported to continue strong, together with low phosphorus.

There is no evidence in the market yet of hesitancy as the result of prospective or current contract cutbacks after the victory in Europe. Dealers are reported to feel reasonable assurance that current reconversion planning will afford a market for scrap in period one.

•

PITTSBURGH—While June contracts for short shoveling turnings up to this time have been made on a $16 basis, there are several large ones yet to be negotiated and some observers feel that the price may continue to hold at $16.50. Hence, the dollar spread in the quotation on this item. On the whole, observers report a firmer tone in the turnings market and in the unprepared scrap market. While machine shop turnings are quoted at $12 to $12.50, one dealer in this area reports that he is paying in the neighborhood of the $13 to $13.50 range for alloy free, carbon steel long and short machine shop turnings. The effects of the shell cutbacks on low phos have not yet been felt and no undue shortage has been noticeable in the supply of this item. Heavy grades are still firm in price here, despite weaknesses in the East.

•

CHICAGO—Increased buyer caution, with emphasis on quick delivery for immediate needs is in evidence. Heavy open hearth grades remain strong with no abundance in evidence. Purchases of bundled machine shop turnings last week at $18 by one broker have not been followed by other buyers, and deliveries still are being made at the previous range of $16.25 to $16.75. Mill offers of $10 for machine shop turnings are not meeting an enthusiastic reception, and bundlers are dominating transactions in this grade with a somewhat higher price. Blast furnace grades appear subject to downward fluctuation.

•

PHILADELPHIA — The movement of scrap out of this district to Pittsburgh has acted to stabilize prices here. Purchasing by Eastern Pennsylvania producers, however, is slight and price changes are not in evidence. Whether this is a forerunner of an upward trend is difficult to predict since the tonnages involved are not sufficiently large to be representative.

•

NEW YORK—The price spread reported in the New York market last week on open hearth grades has been narrowed this week to a range of $14.83 to $15.17 for No. 1 and 2 heavy melting; $12.83 to $14.83 for black bundles and $10.83 to $12.83 for galvanized bundles. Turnings continue at $6.50. Cast grades continue at ceilings. Dealers believe that little or no scrap is going to Bethlehem Steel Co., whose prices are indicated by the low end of the ranges. On the other hand, shipments of scrap continue out of this area into Pittsburgh. Movement of scrap continues fairly good, but open hearth grades are being supported by western demand.

•

CLEVELAND—Actual sales supply no price changes this week, although some strengthening of the turnings market is in the wind with production decreasing because of cancellations and indications are that the demand is returning. It is felt in some quarters that there is too much spread between machine shop and short shoveling turnings, which is resulting in dealers taking turnings to their yards and culling out the short turnings. A lot of this has been done in recent weeks, but so far as is known, no consumers of machine shop will buy these culled or skinned turnings. On the whole, there are rather definite indications that the market may advance, with wholesale steel cancellations the conditioning factor. None of the blast furnaces in this district has any great amount of scrap, and blast furnace is definitely on the short end.

•

CINCINNATI — Brokers are moving cautiously in a market virtually devoid of trend indications. Heavy grades of scrap are in reasonable demand and consumers are taking on contract, but so far despite the fact that several important contracts expire within the next 30 days, there appears to be no strong desire to consider new commitments. Borings, turnings, and lighter grades continue to show weakness, but prices are currently unchanged. Yard operators indicate a fair amount of material on hand, and report inability to move because of lack of labor to prepare it.

•

ST. LOUIS—May shipments of scrap iron to the St. Louis market were estimated to be about 15 per cent ahead of April, with most of the material allocated. Two steel mills have placed small orders for June shipment, with a limit of $1 on freight charges, with further commitments expected after June 1, depending upon the extent of cutbacks. Some orders for steel castings also have been placed. Borings and turnings are still a drug on the market, and these and uncut locomotive tires are lower.

•

BUFFALO—2400 tons of scrap have arrived by barge canal from New York the first shipment via the canal this month. Several vessels are expected from the upper lakes in the early part of the coming week. Dealers report that none of the mills in this area has an ample supply of scrap. One large consumer is reported to have made an offer of $3 below ceiling for open hearth grades and $10 for machine shop turnings, but this was not acceptable to local dealers. However, while sales at these prices were not made, the offer caused the price situation here to be somewhat confusing. Nevertheless there are no price changes this week.

•

DETROIT—A firming tendency was noted in most grades preliminary to the opening of automotive lists at midweek, probably caused in part by reports of buying in Chicago and other areas. Open hearth grades were particularly in demand at full ceiling prices, and strengthening was seen by some sources in blast furnace scrap. The only exceptions to the general firmness seemed to be in low phos grades and machine shop turnings. No price changes were evident, however.

IRON AND STEEL SCRAP PRICES

Going prices as obtained in the trade by IRON AGE editors, based on representative tonnages (for ceiling prices see O. P. A. schedule No. 4). Where ceiling prices are quoted they do not include brokerage fee or adjusted transportation charges. Asterisks indicate grades selling at ceilings.

PITTSBURGH

Per gross ton delivered to consumer:

No. 1 hvy. melting		$20.00*
RR. hvy. melting		21.00*
No. 2 hvy. melting		20.00*
RR. scrap rails		21.50*
Rails 3 ft. and under		23.50*
No. 1 comp'd sheets		20.00*
Hand bdld. new shts.		20.00*
Hvy. axle turn.		19.50*
Hvy. steel forge turn.		19.50*
Mach. shop turn.	$12.00 to	12.50
Short shov. turn.	15.50 to	16.50
Mixed bor. and turn.	12.00 to	12.50
Cast iron borings	15.00 to	15.50
Hvy. break. cast.		16.50*
No. 1 cupola		20.00*
RR. knuck. and coup.		24.50*
RR. coil springs		24.50*
Rail leaf springs		24.50*
Rolled steel wheels		24.50*
Low phos. bil. crops		25.00*
Low phos.		22.50*
RR. malleable		22.00*

CHICAGO

Per gross ton delivered to consumer:

No. 1 hvy. melting		$18.75*
No. 2 hvy. melting		18.75*
No. 1 bundles		18.75*
No. 2 dealers' bndls.		18.75*
Bundled mach. shop turn.	$16.25 to	18.00
Galv. bundles	14.25 to	14.75
Mach. shop turn.	10.00 to	11.00
Short shovel. turn.	12.00 to	12.50
Cast iron borings	12.00 to	12.50
Mix. borings & turn.	12.00 to	12.50
Low phos. hvy. forge		23.75*
Low phos. plates		21.25*
No. 1 RR. hvy. melt.		19.75*
Reroll rails		22.25*
Miscellaneous rails		20.25*
Rails 3 ft. and under		22.25*
Locomotive tires, cut	22.50 to	23.00
Cut bolsters & side frames	19.75 to	20.25
Angles & Splice bars		22.25*
Standard stl. car axles	23.50 to	24.00
No. 3 steel wheels	22.00 to	22.50
Couplers & knuckles		23.25*
Agricul. malleable		22.00*
RR. malleable		22.00*
No. 1 mach. cast.		20.00*
No. 1 agricul. cast.		20.00*
Hvy. breakable cast.		16.50*
RR. grate bars		15.25*
Cast iron brake shoes		15.25*
Stove plate		19.00*
Clean auto cast.		20.00*
Cast iron carwheels		20.00*

CINCINNATI

Per gross ton delivered to consumer:

No. 1 hvy. melting		$19.50*
No. 2 hvy. melting		19.50*
No. 1 bundles		19.50*
No. 2 bundles		19.50*
Mach. shop turn.	$7.00 to	7.50
Shoveling turn.	8.00 to	8.50
Cast iron borings	8.00 to	8.50
Mixed bor. & turn.	7.00 to	7.50
Low phos. plate		22.00*
No. 1 cupola cast		20.00*
Hvy. breakable cast		16.50*
Stove plate		19.00*
Scrap rails		21.00

BOSTON

Dealers' buying prices per gross ton, f.o.b. cars

No. 1 hvy. melting	$14.06 to	$15.05*
No. 2 hvy. melting	14.06 to	15.05*
No. 1 and 2 bundles	14.06 to	15.05*
Busheling		14.06
Turnings, shovelings		7.50
Machine shop turn.		5.50
Mixed bor. & turn.		5.50
Cl'n cast, chem. bor.	13.06 to	14.15*
Truck delivery to foundry		
Machinery cast	21.00 to	23.51*
Breakable cast	21.57 to	21.87*
Stove plate	20.00 to	23.51*

DETROIT

Per gross ton, brokers' buying prices:

No. 1 hvy. melting		$17.32*
No. 2 hvy. melting		17.32*
No. 1 bundles		17.32*
New busheling		17.32*
Flashings		17.32*
Mach. shop turn.	$7.50 to	8.00
Short shov. turn.	10.25 to	10.75
Cast iron borings	9.50 to	10.00
Mixed bor. & turn.	7.50 to	8.00
Low phos. plate	19.32 to	19.82
No. 1 cupola cast.		20.00*
Charging box cast.	18.00 to	19.00
Hvy. breakable cast		16.50*
Stove plate	18.50 to	19.00
Automotive cast		20.00*

PHILADELPHIA

Per gross ton delivered to consumer:

No. 1 hvy. melting	$17.75 to	18.25
No. 2 hvy. melting	17.75 to	18.25
No. 2 bundles	15.75 to	16.25
Mach. shop turn.	9.00 to	9.50
Shoveling turn.	10.50 to	11.50
Cast iron borings	11.00 to	11.50
Mixed bor. & turn.	9.00 to	9.50
No. 1 cupola cast		20.00*
Hvy. breakable cast		16.50*
Cast, charging box		19.00*
Hvy. axle, forge turn.	17.00 to	17.50
Low phos. plate	20.25 to	21.25
Low phos. punchings	20.25 to	21.25
Billet crops	20.25 to	21.25
RR. steel wheels		23.25*
RR. coil springs		23.25*
RR. malleable		22.00*

ST. LOUIS

Per gross ton delivered to consumer:

Heavy melting		$17.50*
Bundled sheets		17.50*
Mach. shop turn.		7.00
Hvy. axle turn.		10.00
Locomotive tires, uncut.		17.00
Misc. std. sec. rails		19.00*
Rerolling rails		21.00*
Steel angle bars		21.00*
Rails 3 ft. and under		21.50*
RR. springs		22.00*
Steel car axles		23.50*
Stove plate		19.00*
Grate bars		15.25*
Brake shoes		15.25*
RR. malleable		22.00*
Cast iron carwheels		20.00*
No. 1 mach'ery cast		20.00*
Breakable cast		16.50*

BIRMINGHAM

Per gross ton delivered to consumer:

No. 1 hvy. melting		$17.00*
No. 2 hvy. melting		17.00*
No. 2 bundles		17.00*
No. 1 busheling		17.00*
Long turnings	$9.50 to	10.00
Cast iron borings	9.50 to	10.00
Bar crops and plate		19.50*
Structural and plate		19.50*
No. 1 cast		20.00*
Stove plate		17.00
Steel axles		18.00*
Scrap rails		18.50
Rerolling rails		20.50*
Angles & splice bars		20.50*
Rails 3 ft. & under		21.00*
Cast iron carwheels	16.50 to	17.00

YOUNGSTOWN

Per gross ton delivered to consumer:

No. 1 hvy. melting		$20.00*
No. 2 hvy. melting		20.00*
Low phos. plate		22.50*
No. 1 busheling		20.00*
Hydraulic bundles		20.00*
Mach. shop turn.	$11.50 to	12.00
Short shovel. turn.	15.00 to	15.50
Cast iron borings	14.00 to	14.50

NEW YORK

Brokers' buying prices per gross ton, on cars:

No. 1 hvy. melting	$14.83 to	$15.17
No. 2 hvy. melting	14.83 to	15.17
Comp. black bundles	12.83 to	14.83
Comp. galv. bundles	10.83 to	12.83
Mach. shop turn.		6.50
Mixed bor. & turn.		6.50
Shoveling turn.		8.50
No. 1 cupola cast.		20.00*
Hvy. breakable cast		16.50*
Charging box cast.		19.00*
Stove plate		19.00*
Clean auto cast.		20.00*
Unstrip. motor blks.		17.50*
Cl'n chem. cast bor.		14.33*

BUFFALO

Per gross ton delivered to consumer:

No. 1 hvy. melting		$19.25*
No. 1 bundles		19.25*
No. 2 bundles		19.25*
No. 2 hvy. melting		19.25*
Mach. shop turn.		12.00
Shoveling turn.	14.00 to	14.50
Cast iron borings		13.00
Mixed bor. & turn.		12.00
No. 1 cupola cast.		20.00*
Stove plate		19.00*
Low phos. plate		21.75*
Scrap rails		20.75*
Rails 3 ft. & under		22.75*
RR. steel wheels		23.75*
Cast iron car wheels		20.00*
RR. coil & leaf spgs.		23.75*
RR. knuckles & coup.		23.75*
RR. malleable		22.00*
No. 1 busheling		19.25*

CLEVELAND

Per gross ton delivered to consumer:

No. 1 hvy. melting		$19.50*
No. 2 hvy. melting		19.50*
Compressed sheet stl.		19.50*
Drop forge flashings		19.00*
No. 2 bundles		19.50*
Mach. shop turn.	$10.00 to	10.50
Short shovel.	14.00 to	14.50
No. 1 busheling		19.50*
Steel axle turn.		19.00*
Low phos. billet and bloom crops		24.50*
Cast iron borings	13.00 to	13.50
Mixed bor. & turn.	12.00 to	12.50
No. 2 busheling		17.00*
No. 1 machine cast		20.00*
Railroad cast		20.00*
Railroad grate bars		15.25*
Stove plate		19.00*
RR. hvy. melting		20.50*
Rails 3 ft. & under		23.00*
Rails 18 in. & under		24.25*
Rails for rerolling		23.00*
Railroad malleable		22.00*
Elec. furnace punch		22.00*

SAN FRANCISCO

Per gross ton delivered to consumer:

RR. hvy. melting		$17.00
No. 1 hvy. melting		17.00*
No. 2 hvy. melting		17.00*
No. 2 bales	13.50 to	14.25
No. 3 bales	9.50 to	10.59
Mach. shop turn.		7.00
Elec. furn. 1 ft., und.	15.50 to	17.00
No. 1 cupola cast.	19.00 to	21.00

LOS ANGELES

Per gross ton delivered to consumer:

No. 1 hvy. melting	$14.50 to	$15.50
No. 2 hvy. melting	13.50 to	14.50
No. 2 bales	12.50 to	13.50
No. 3 bales	9.00 to	10.00
Mach. shop turn.		4.50
No. 1 cupola cast.	19.00 to	21.00

SEATTLE

Per gross ton delivered to consumer:

RR. hvy. melting		$14.50
No. 1 hvy. melting		14.50*
No. 3 bundles		11.50
Elec. furn. 1 ft., und.		17.00
No. 1 cupola cast.		20.00*

Comparison of Prices . .

Advances Over Past Week in **Heavy Type**; Declines in *Italics*. Prices are F.O.B. Major Basing Points. The various basing points for finished and semi-finished steel are listed in the detailed price tables, pages 122-131.

Flat Rolled Steel: (Cents Per Lb.)	May 29, 1945	May 22, 1945	Apr. 24, 1945	May 30, 1944
Hot rolled sheets	2.20	2.20	2.20	2.10
Cold rolled sheets	3.05	3.05	3.05	3.05
Galvanized sheets (24 ga.)	3.70	3.65	3.65	3.50
Hot rolled strip	2.10	2.10	2.10	2.10
Cold rolled strip	2.80	2.80	2.80	2.80
Plates	2.25	2.20	2.20	2.10
Plates, wrought iron	3.80	3.80	3.80	3.80
Stain's c.r. strip (No. 302)	28.00	28.00	28.00	28.00
Tin and Terne Plate: (Dollars Per Base Box)				
Tin plate, standard cokes	$5.00	$5.00	$5.00	$5.00
Tin plate, electrolytic	4.50	4.50	4.50	4.50
Special coated mfg. ternes	4.30	4.30	4.30	4.30
Bars and Shapes: (Cents Per Lb.)				
Merchant bars	2.25	2.15	2.15	2.15
Cold finished bars	2.65	2.65	2.65	2.65
Alloy bars	2.70	2.70	2.70	2.70
Structural shapes	2.10	2.10	2.10	2.10
Stainless bars (No. 302)	24.00	24.00	24.00	24.00
Wrought iron bars	4.40	4.40	4.40	4.40
Wire and Wire Products: (Cents Per Lb.)				
Bright wire	2.75	2.60	2.60	2.60
Wire nails	2.90	2.80	2.80	2.55
Rails: (Dollars Per Gross Ton)				
Heavy rails	$43.00	$43.00	$43.00	$40.00
Light rails	45.00	43.00	43.00	40.00
Semi-Finished Steel: (Dollars Per Gross Ton)				
Rerolling billets	$36.00	$34.00	$34.00	$34.00
Sheet bars	36.00	34.00	34.00	34.00
Slabs, rerolling	36.00	34.00	34.00	34.00
Forging billets	42.00	40.00	40.00	40.00
Alloy blooms, billets, slabs	54.00	54.00	54.00	54.00
Wire Rods and Skelp: (Cents Per Lb.)				
Wire rods	2.15	2.00	2.00	2.00
Skelp	1.90	1.90	1.90	1.90

Latest steel price increase, Amendment 13 to RPS6, effective May 23, 1945.

Pig Iron: (Per Gross Ton)	May 29, 1945	May 22, 1945	Apr. 24, 1945	May 30, 1944
No. 2 fdy., Philadelphia	$26.84	$26.84	$26.84	$25.84
No. 2, Valley furnace	25.00	25.00	25.00	24.00
No. 2, Southern, Cin'ti	26.11	26.11	26.11	25.11
No. 2, Birmingham	21.38	21.38	21.38	20.38
No. 2, foundry, Chicago†	25.00	25.00	25.00	24.00
Basic, del'd eastern Pa.	26.34	26.34	26.34	25.34
Basic, Valley furnace	24.50	24.50	24.50	23.50
Malleable, Chicago†	25.00	25.00	25.00	24.00
Malleable, Valley	25.00	25.00	25.00	24.00
L. S. charcoal, Chicago*	42.34	42.34	42.34	37.34
Ferromanganese‡	135.00	135.00	135.00	135.00

† The switching charge for delivery to foundries in the Chicago district is 60c. per ton.

‡ For carlots at seaboard.

Last pig iron price change authorized by OPA effective Feb. 14, 1945.

* Charcoal price increase retroactive to March 7, on contracts to Feb. 13.

Scrap: (Per Gross Ton)				
Heavy melt'g steel, P'gh.	$20.00	$20.00	$20.00	$20.00
Heavy melt'g steel, Phila.	18.00	18.00	18.75	18.75
Heavy melt'g steel, Ch'go	18.75	18.75	18.75	18.75
No. 1 hy. comp. sheet, Det.	17.32	17.32	17.32	17.85
Low phos. plate, Youngs'n	22.50	22.50	22.50	22.50
No. 1 cast, Pittsburgh	20.00	20.00	20.00	20.00
No. 1 cast, Philadelphia	20.00	20.00	20.00	20.00
No. 1 cast, Chicago	20.00	20.00	20.00	20.00
Coke, Connellsville: (Per Net Ton at Oven)				
Furnace coke, prompt	$7.50	$7.00	$7.00	$7.00
Foundry coke, prompt	9.00	8.25	8.25	8.25
Non-Ferrous Metals: (Cents Per Lb. to Large Buyers)				
Copper, electro., Conn.	12.00	12.00	12.00	12.00
Copper, Lake	12.00	12.00	12.00	12.00
Tin (Straits), New York	52.00	52.00	52.00	52.00
Zinc, East St. Louis	8.25	8.25	8.25	8.25
Lead, St. Louis	6.35	6.35	6.35	6.35
Aluminum, Virgin, del'd.	15.00	15.00	15.00	15.00
Nickel, electrolytic	35.00	35.00	35.00	35.00
Magnesium, ingot	20.50	20.50	20.50	20.50
Antimony, Laredo, Tex.	14.50	14.50	14.50	14.50

Composite Prices . .

Starting with the issue of April 22, 1943, the weighted finished steel price index was revised for the years 1941, 1942 and 1943. See explanation of the change on page 90 of the April 22, 1943, issue. Index revised to a quarterly basis as of Nov. 16, 1944; for details see p. 98 of that issue. The finished steel composite prices for the current quarter are an estimate based on finished steel shipments for the previous quarter. These figures will be revised when the actual data of shipments for this quarter are compiled.

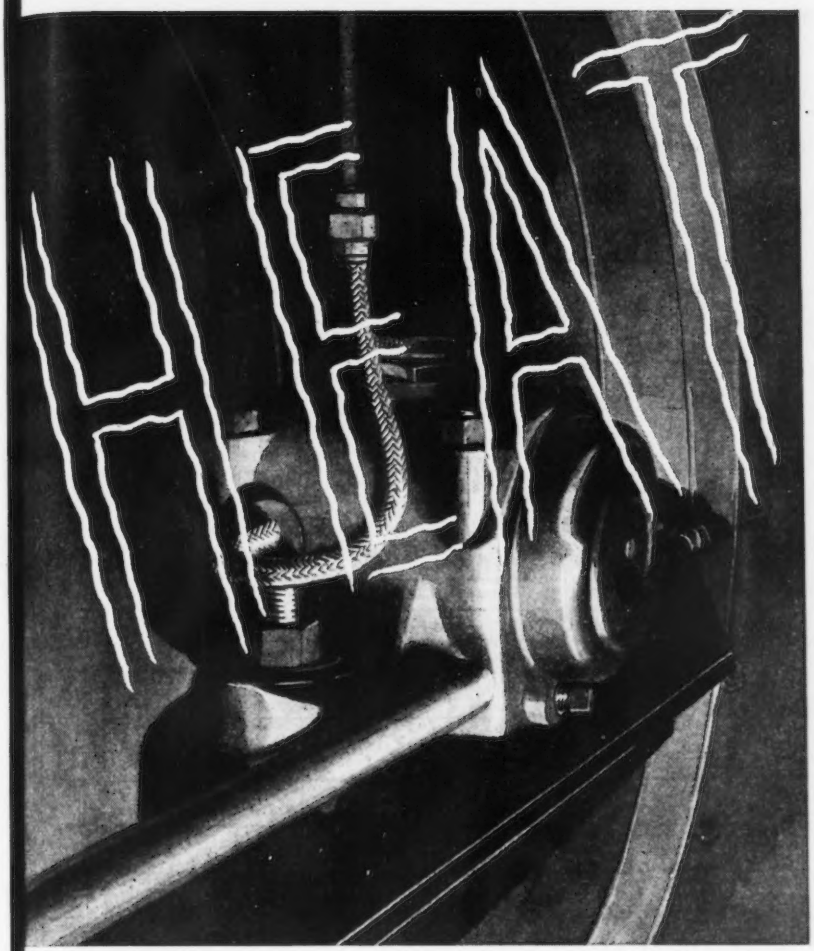
	FINISHED STEEL	PIG IRON	SCRAP STEEL
May 29, 1945	2.41571c. a Lb.	$24.61 a Gross Ton	$18.92 a Gross Ton
One week ago	2.38444c. a Lb.	$24.61 a Gross Ton	$18.92 a Gross Ton
One month ago	2.38444c. a Lb.	$24.61 a Gross Ton	$19.17 a Gross Ton
One year ago	2.30329c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton

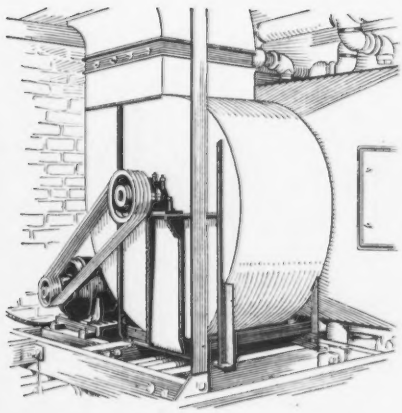
	FINISHED STEEL HIGH	FINISHED STEEL LOW	PIG IRON HIGH	PIG IRON LOW	SCRAP STEEL HIGH	SCRAP STEEL LOW
1945	2.41571c., May 29	2.21189c., Jan. 2	$24.61, Feb. 20	$23.61, Jan. 2	$19.17	$19.17
1944	2.30837c., Sept. 5	2.21189c., Oct. 5	$23.61	$23.61	19.17	$15.67, Oct. 24
1943	2.25513c.	2.25513c.	23.61	23.61	19.17	19.17
1942	2.26190c.	2.26190c.	23.61	23.61	19.17	19.17
1941	2.43078c.	2.43078c.	$23.61, Mar. 20	$23.45, Jan. 2	$22.00, Jan. 7	$19.17, Apr. 10
1940	2.30467c., Jan. 2	2.24107c., Apr. 16	23.45, Dec. 23	22.61, Jan. 2	21.83, Dec. 30	16.04, Apr. 9
1939	2.35367c., Jan. 3	2.26689c., May 16	22.61, Sept. 19	20.61, Sept. 12	22.50, Oct. 3	14.08, May 16
1938	2.58414c., Jan. 4	2.27207c., Oct. 18	23.25, June 21	19.61, July 6	15.00, Nov. 22	11.00, June 7
1937	2.58414c., Mar. 9	2.32263c., Jan. 4	23.25, Mar. 9	20.25, Feb. 16	21.92, Mar. 30	12.67, June 8
1936	2.32263c., Dec. 28	2.05200c., Mar. 10	19.74, Nov. 24	18.73, Aug. 11	17.75, Dec. 21	12.67, June 9
1935	2.07642c., Oct. 1	2.06492c., Jan. 8	18.84, Nov. 5	17.83, May 14	13.42, Dec. 10	10.33, Apr. 29
1934	2.15367c., Apr. 24	1.95757c., Jan. 2	17.90, May 1	16.90, Jan. 27	13.00, Mar. 13	9.50, Sept. 25
1933	1.95578c., Oct. 3	1.75836c., May 2	16.90, Dec. 5	13.56, Jan. 3	12.25, Aug. 8	6.75, Jan. 3
1932	1.89196c., July 5	1.83901c. Mar. 1	14.81, Jan. 5	13.56, Dec. 6	8.50, Jan. 12	6.43, July 5
1931	1.99626c., Jan. 13	1.86586c., Dec. 29	15.90, Jan. 6	14.79, Dec. 15	11.33, Jan. 6	8.50, Dec. 29
1930	2.25488c., Jan. 7	1.97319c., Dec. 9	18.21, Jan. 7	15.90, Dec. 16	15.00, Feb. 18	11.25, Dec. 9
1929	2.31773c., May 28	2.26498c., Oct. 29	18.71, May 14	18.21, Dec. 17	17.58, Jan. 29	14.08, Dec. 3

Weighted index based on steel bars, shapes, plates, wire, rails, black pipe, hot and cold-rolled sheets and strip, representing 78 per cent of the United States output. Index recapitulated in Aug. 28, 1941, issue.

Based on averages for basic iron at Valley furnaces and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Southern iron at Cincinnati.

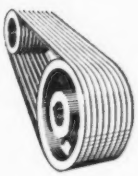
Based on No. 1 heavy melting steel scrap quotations to consumers at Pittsburgh, Philadelphia and Chicago.

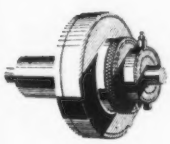




DODGE BEAT THE HEAT THAT RUINED BEARINGS

THE RIGHT DRIVE FOR THE JOB



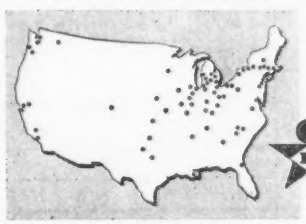


TO SAVE TIME in drying fine papers, the Strathmore Paper Co., West Springfield, Mass., installed a battery of warm air blowers. The heat applied directly to finished paper cut the drying time but created a prohibitive maintenance problem.

One bearing in each of the blowers, of necessity, was inside the blower housing, directly opposite the source of heat. Result: lubrication difficulty, bearing failure, and frequent replacement required!

Dodge Transmissioneering saved the situation. Operating conditions were analyzed and Dodge water cooled Sleevoil precision pillow blocks prescribed. Specifically designed for operation in elevated temperatures, these Dodge bearings now carry the power load efficiently, dependably. Thus an industry saves precious production time, cuts power costs, by using Dodge experience.

For help on power transmission problems in your plant, or applications to your product—for up-to-the-minute news on power drives—call a Transmissioneer, the Dodge distributor in your territory, or write to the



There are 210 Dodge factory graduate Transmissioneers, located in principal cities, to show you new and better ways of transmitting power.

Sign of the Dodge Transmissioneer

DODGE MANUFACTURING CORPORATION, MISHAWAKA, INDIANA

DODGE
MISHAWAKA

TRANSMISSIONEERED MEANS ADVANCED DESIGN IN POWER DRIVES

Prices of Finished Iron and Steel . . .

Steel prices shown here are f.o.b. basing points, in cents per lb. unless otherwise indicated. Extras apply. Delivered prices do not reflect 3% tax on freight. (1) Mill run sheet, 10c. per 100 lb. under base; primes, 25c. above base. (2) Unassorted commercial coating. (3) Widths up to 12-in. inclusive. (4) 0.25 carbon and less. (5) Applies to certain width and length limitations. (6) For merchant trade. (7) For straight length material only from producer to consumer. Discount of 25c. per 100 lb. to fabricators. (8) Also shafting. For quantities of 20,000 to 29,999 lb. (9) Carload lot in manufacturing trade. (10) Prices do not apply if rail and water is not used. (12) Boxed. (13) Portland and Seattle price, San Francisco 2.50c. (14) This base price for annealed, bright finish wires, commercial spring wire. (15) Produced to dimensional tolerances in AISI Manual Sect. 6. For price exceptions to finished and semi-finished steels turn two pages.

Basing Point / Product	Pittsburgh	Chicago	Gary	Cleveland	Birmingham	Buffalo	Youngstown	Sparrows Point	Granite City	Middletown, Ohio	Gulf Ports, Cars	Pacific Ports, Cars [10]	DELIVERED TO Detroit	New York	Philadelphia
SHEETS															
Hot rolled	2.20¢	2.20¢	2.20¢	2.20¢	2.20¢	2.20¢	2.20¢	2.20¢	2.30¢	2.20¢		2.75¢	2.30¢	2.44¢	2.37¢
Cold rolled [1]	3.05¢	3.05¢	3.05¢	3.05¢		3.05¢	3.05¢		3.15¢	3.05¢		3.70¢	3.15¢	3.39¢	3.37¢
Galvanized (24 gage)	3.70¢	3.70¢	3.70¢		3.70¢	3.70¢	3.70¢	3.70¢	3.80¢	3.70¢		4.25¢		3.94¢	3.87¢
Enameling (20 gage)	3.45¢	3.45¢	3.45¢	3.45¢			3.45¢		3.55¢	3.45¢		4.10¢	3.55¢	3.81¢	3.77¢
Long ternes [2]	3.80¢	3.80¢	3.80¢									4.55¢		4.16¢	4.12¢
STRIP															
Hot rolled [3]	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢			2.10¢		2.75¢	2.20¢	2.46¢	
Cold rolled [4]	2.80¢	2.90¢		2.80¢			2.80¢	(Worcester=3.00¢)					2.90¢	3.16¢	
Cooperage stock	2.20¢	2.20¢			2.20¢		2.20¢							2.56¢	
Commodity C-R	2.95¢	3.05¢		2.95¢			2.95¢	(Worcester=3.35¢)					3.05¢	3.31¢	
TIN PLATE															
Standard cokes, base box	$5.00	$5.00	$5.00						$5.10					5.36¢	5.33¢
Electro, box 0.25 lb.	$4.35	$4.35	$4.35												
Electro, box 0.50 lb.	$4.50	$4.50	$4.50						$4.60						
Electro, box 0.75 lb.	$4.65		$4.65						$4.75						
BLACK PLATE															
29 gage [5]	3.05¢	3.05¢	3.05¢						3.15¢			4.05¢[12]			3.37¢
TERNES, MFG.															
Special coated, base box	$4.30	$4.30	$4.30						$4.40						
BARS															
Carbon steel	2.25¢	2.25¢	2.25¢	2.25¢	2.25¢	2.25¢		(Duluth=2.35¢)			2.60¢	2.90¢	2.35¢	2.59¢	2.57¢
Rail steel [6]	2.25¢	2.25¢	2.25¢	2.25¢	2.25¢	2.25¢					2.60¢	2.90¢			
Reinforcing (billet) [7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢			2.50¢	2.55¢[12]	2.25¢	2.39¢	
Reinforcing (rail) [7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢				2.50¢	2.55¢[12]	2.25¢		2.47¢
Cold finished [8]	2.65¢	2.65¢	2.65¢	2.65¢		2.65¢		(Detroit=2.70¢)			(Toledo=2.80¢)			2.99¢	2.97¢
Alloy, hot rolled	2.70¢	2.70¢				2.70¢		(Bethlehem, Massillon, Canton=2.70¢)					2.80¢		
Alloy, cold drawn	3.35¢	3.35¢	3.35¢	3.35¢		3.35¢							3.45¢		
PLATES								(Coatesville and Claymont=2.25¢)							
Carbon steel [15]	2.25¢	2.25¢	2.25¢	2.25¢	2.25¢		2.25¢	2.25¢	2.50¢		2.60¢	2.80¢	2.47¢	2.44¢	2.30¢
Floor plates	3.35¢	3.35¢									3.85¢	4.15¢		3.86¢	3.82¢
Alloy	3.50¢	3.50¢			(Coatesville=3.50¢)						3.95¢	4.15¢		3.70¢	3.59¢
SHAPES															
Structural	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢		(Bethlehem=2.10¢)			2.45¢	2.75¢		2.27¢	2.215¢
SPRING STEEL, C-R															
0.26 to 0.50 Carbon	2.80¢			2.80¢			(Worcester=3.00¢)								
0.51 to 0.75 Carbon	4.30¢			4.30¢			(Worcester=4.50¢)								
0.76 to 1.00 Carbon	6.15¢			6.15¢			(Worcester=6.35¢)								
1.01 to 1.25 Carbon	8.35¢			8.35¢			(Worcester=8.55¢)								
WIRE [9]															
Bright [14]	2.75¢	2.75¢		2.75¢	2.75¢		(Worcester=2.85¢)		(Duluth=2.80¢)			3.25¢			3.07¢
Galvanized	Add proper size extra and galvanizing extra to Bright Wire base														
Spring (High Carbon)	3.35¢	3.35¢		3.35¢			(Worcester=3.45¢)					3.85¢			3.67¢
PILING															
Steel Sheet	2.40¢	2.40¢				2.40¢						2.95¢			2.72¢

SEMI-FINISHED STEEL

Ingots, Carbon, Rerolling

Base per gross ton, f.o.b. mill.... $31.00

Ingots, Carbon, Forging

Base per gross ton, f.o.b. Birmingham, Buffalo, Chicago, Cleveland, Gary, Pittsburgh, Youngstown $36.00

Ingots, Alloy

Base per gross ton, f.o.b. Bethlehem, Buffalo, Canton, Coatesville, Chicago, Massillon, Pittsburgh $45.00

Billets, Blooms and Slabs

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point (rerolling only). Prices delivered Detroit are $2.00 higher; delivered E. Michigan, $3 higher; f.o.b. Duluth, billets only, $2.00 higher; billets f.o.b. Pacific ports are $12 higher. Provo, $11.20 higher. Delivered prices do not reflect three per cent tax on freight rates.

Per Gross Ton

Rerolling $36.00
Forging quality 42.00

Alloy Billets, Blooms, Slabs

Pittsburgh, Chicago, Canton, Massillon, Buffalo or Bethlehem, per gross ton $54.00

Price delivered Detroit $2.00 higher; East Michigan, $3.00 higher.

Sheet Bars

Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point.

Per Gross Ton

Open hearth or bessemer $36.00

PRICES

Skelp

Pittsburgh, Chicago, Youngstown, Coatesville, Pa., Sparrows Point, Md.

	Per Lb.
Grooved, universal and sheared	1.90c.

Wire Rods

(No. 5 to 9/32 in.)

	Per Lb.
Pittsburgh, Chicago, Cleveland	2.15c.
Worcester, Mass.	2.25c.
Birmingham	2.15c.
San Francisco	2.65c.
Galveston	2.40c.

9/32 in. to 47/64 in., 0.15c. a lb. higher. Quantity extras apply.

Shell Steel

	Per Gross Ton
3 in. to 12 in.	$52.00
12 in. to 18 in.	54.00
18 in. and over	56.00

Basic open hearth shell steel, f.o.b. Pittsburgh, Chicago, Buffalo, Gary, Cleveland, Youngstown and Birmingham.

Prices delivered Detroit are $2.00 higher; East Michigan, $3 higher.

Price Exceptions: Follansbee Steel Corp. permitted to sell at $13.00 per gross ton, f.o.b. Toronto, Ohio, above base price of $52.00.

Note: The above base prices apply on lots of 1000 tons of a size and section to which are to be added extras for chemical requirements, cutting, or quantity.

RAILS, TRACK SUPPLIES

(F.o.b. Mill)

Standard rails, heavier than 60 lb., No. 1 O.H., gross ton	$43.00
Angle splice bars, 100 lb.	2.70
(F.o.b. Basing Points)	*Per Gross Ton*
Light rails (from billets)	$45.00
Light rails (from rail steel)	39.00
	Base per Lb.
Cut spikes	3.25c.
Screw spikes	5.40c.
Tie plate, steel	2.30c.
Tie plates, Pacific Coast	2.45c.
Track bolts	4.75c.
Track bolts, heat treated, to railroads	5.00c.
Track bolts, jobbers discount	63-5

Basing points, light rails, Pittsburgh, Chicago, Birmingham; cut spikes and tie plates—Pittsburgh, Chicago, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., Birmingham and Pacific Coast ports; tie plates alone—Steelton, Pa., Buffalo. Cut spikes alone—Youngstown, Lebanon, Pa., Richmond, Oregon and Washington ports, add 25c.

TOOL STEEL

(F.o.b. Pittsburgh, Bethlehem, Syracuse)

	Base per lb.
High speed	67c.
Straight molybdenum	54c.
Tungsten-molybdenum	57½c.
High-carbon-chromium	43c.
Oil hardening	24c.
Special carbon	22c.
Extra carbon	18c.
Regular carbon	14c.

Warehouse prices east of Mississippi are 2c. a lb. higher; west of Mississippi 3c. higher.

WIRE PRODUCTS

To the trade, f.o.b. Pittsburgh, Chicago, Cleveland, Birmingham, Duluth

	Basing Points Named	Pacific Coast Basing Points†
	Base per Keg	
Standard wire nails	$2.90	$3.40
Coated nails	2.90	3.40
Cut nails, carloads	3.85	....
	Base per 100 Lb.	
Annealed fence wire	$3.05	$3.55
Annealed galv. fence wire	3.40	3.90
	Base Column	
Woven wire fence*	67	35
Fence posts, carloads	69	86
Single loop bale ties	66	91
Galvanized barbed wire**	72	87
Twisted barbless wire	72	....

*15½ gage and heavier. **On 80-rod spools in carload quantities.

†Prices subject to switching or transportation charges.

WAREHOUSE PRICES

Delivered metropolitan areas per 100 lb. These are zoned warehouse prices in conformance with latest zoning amendment to OPA Price Schedule 49.

Cities	SHEETS			STRIP		Plates ¼ in. and heavier	Structural Shapes	BARS		ALLOY BARS			
	Hot Rolled (10 gage)	Cold Rolled	Galvanized (24 gage)	Hot Rolled	Cold Rolled			Hot Rolled	Cold Finished	Hot Rolled, NE 8617-20	Hot Rolled, NE 9442-45 Ann.	Cold Drawn, NE 8617-20	Cold Drawn, NE 9442-48 Ann.
**Philadelphia	$3.518	$4.872[6]	$5.158a	$3.822	$4.772	$3.605	$3.686	$3.822	$4.072	$5.968	$7.066	$7.272	$8.322
New York	3.59	4.613[3]	5.110	3.974[6]	4.772	3.768	3.758	3.853	4.103	5.858	6.908	7.103	8.203
Boston	3.744	4.744[9]	5.224[9]	4.108	4.715	3.912	3.912	4.044	4.144	6.162	7.262	7.344	8.394
Baltimore	3.394	4.852	4.894	3.902	4.752	3.594	3.759	3.802	4.052	....	....	....	....
Norfolk	3.771	4.965	5.371	4.165	4.865	3.971	4.002	4.065	4.165	....	....	....	....
Chicago	3.25	4.20	5.231	3.60	4.65[17]	3.55	3.55	3.50	3.75	5.75	6.85	6.85	7.90
Milwaukee	3.387	4.337[3]	5.272[4]	3.737	4.787[17]	3.687	3.687	3.637	3.887	5.987	7.087	7.087	8.137
Cleveland	3.35	4.40	4.877[4]	3.60	4.45	3.40	3.588	3.35	3.75	5.956	7.056	6.85	7.90
Buffalo	3.35	4.40	4.75[4]	3.819	4.669	3.63	3.40	3.35	3.75	5.75	6.85	6.85	7.90
Detroit	3.45	4.50	5.00[4]	3.70	4.65[917]	3.609	3.681	3.45	3.80	6.08	7.18	7.189	8.209
Cincinnati	3.425	4.475[3]	4.825[5]	3.675	4.711	3.611	3.691	3.811	4.011	....	....	....	....
St. Louis	3.397	4.347[3]	5.172[4]	3.747	4.831[17]	3.697	3.697	3.647	4.031	6.131	7.231	7.231	8.281
Pittsburgh	3.35	4.40	4.75	3.60	4.45	3.40	3.40	3.35	3.75	5.75	6.85	6.85	7.90
St. Paul	3.51	4.48	5.257[4]	3.86	4.35[17]	3.81[13]	3.81[13]	3.76[13]	4.361	6.09	7.19	7.561	8.711
Omaha	3.865	5.443	5.608[4]	4.215	....	4.165	4.165	4.115	4.43	....	....	....	....
Indianapolis	3.518	4.568	4.548	3.768	4.741	3.63	3.63	3.58	3.98	6.08	7.18	7.18	8.23
Birmingham	3.45	....	4.75	3.70	....	3.55	3.55	3.50	4.43	....	....	....	....
Memphis	3.965[7]	4.66	3.265	4.215	....	4.065	4.065	4.015	4.33	....	....	....	....
New Orleans	4.058*	4.95	5.358	4.308	....	4.158	4.158*	4.108*	4.629	....	....	....	....
Houston	3.763	5.573	6.313[1]	4.313	....	4.25	4.25	3.75	6.373[3]	7.223	8.323	8.323	9.373
Los Angeles	4.10	7.20[5]	6.10[4]	4.95	5.813[15]	4.95	4.65	4.40	5.583	8.304	9.404	9.404	10.454
San Francisco	4.55[14]	7.30[4]	6.35[4]	4.50[14]	7.333[17]	4.65[14]	4.35[14]	4.15[14]	5.333	8.304	9.404	9.404	10.454
Seattle	4.65[12]	7.05[4]	5.95[4]	4.25[12]	....	4.75[12]	4.45[12]	4.35[12]	5.783	....	9.404	....	....
Portland	4.65[11]	6.80[4]	5.75[4]	4.75[11]	....	4.85[11]	4.45[11]	4.45[11]	5.533	8.304	9.404	8.304	9.404
Salt Lake City	4.530[17]	....	6.17[13]	5.53[17]	....	4.98[17]	4.98[17]	4.88[17]	5.90	....	....	....	....

National Emergency Steels

MILL EXTRAS

Designation	Basic Open-Hearth		Electric Furnace		Designation	Basic Open-Hearth		Electric Furnace	
	Bars and Bar-Strip	Billets, Blooms, and Slabs	Bars and Bar-Strip	Billets, Blooms, and Slabs		Bars and Bar-Strip	Billets, Blooms, and Slabs	Bars and Bar-Strip	Billets, Blooms, and Slabs
NE 8612	0.65¢	$13.00	$1.15	$23.00	NE 9427	0.75¢	$15.00	$1.25	$25.00
NE 8615	0.65	13.00	1.15	23.00	NE 9430	0.75	15.00	1.25	25.00
NE 8617	0.65	13.00	1.15	23.00	NE 9432	0.75	15.00	1.25	25.00
NE 8620	0.65	13.00	1.15	23.00	NE 9435	0.75	15.00	1.25	25.00
NE 8622	0.65	13.00	1.15	23.00	NE 9437	0.75	15.00	1.25	25.00
NE 8625	0.65	13.00	1.15	23.00	NE 9440	0.75	15.00	1.25	25.00
NE 8627	0.65	13.00	1.15	23.00	NE 9442	0.80	16.00	1.30	26.00
NE 8630	0.65	13.00	1.15	23.00	NE 9445	0.80	16.00	1.30	26.00
NE 8632	0.65	13.00	1.15	23.00	NE 9447	0.80	16.00	1.30	26.00
NE 8635	0.65	13.00	1.15	23.00	NE 9450	0.80	16.00	1.30	26.00
NE 8637	0.65	13.00	1.15	23.00					
NE 8640	0.65	13.00	1.15	23.00					
NE 8642	0.65	13.00	1.15	23.00	NE 9722	0.65	13.00	1.15	23.00
NE 8645	0.65	13.00	1.15	23.00	NE 9727	0.65	13.00	1.15	23.00
NE 8647	0.65	13.00	1.15	23.00	NE 9732	0.65	13.00	1.15	23.00
NE 8650	0.65	13.00	1.15	23.00	NE 9737	0.65	13.00	1.15	23.00
					NE 9742	0.65	13.00	1.15	23.00
					NE 9745	0.65	13.00	1.15	23.00
NE 8712	0.70	14.00	1.20	24.00	NE 9747	0.65	13.00	1.15	23.00
NE 8715	0.70	14.00	1.20	24.00	NE 9750	0.65	13.00	1.15	23.00
NE 8717	0.70	14.00	1.20	24.00	NE 9763	0.65	13.00	1.15	23.00
NE 8720	0.70	14.00	1.20	24.00	NE 9768	0.65	13.00	1.15	23.00
NE 8722	0.70	14.00	1.20	24.00					
NE 8725	0.70	14.00	1.20	24.00					
NE 8727	0.70	14.00	1.20	24.00	NE 9830	$1.30	26.00	1.80	36.00
NE 8730	0.70	14.00	1.20	24.00	NE 9832	1.30	26.00	1.80	36.00
NE 8732	0.70	14.00	1.20	24.00	NE 9835	1.30	26.00	1.80	36.00
NE 8735	0.70	14.00	1.20	24.00	NE 9837	1.30	26.00	1.80	36.00
NE 8737	0.70	14.00	1.20	24.00	NE 9840	1.30	26.00	1.80	36.00
NE 8740	0.70	14.00	1.20	24.00	NE 9842	1.30	26.00	1.80	36.00
NE 8742	0.70	14.00	1.20	24.00	NE 9845	1.30	26.00	1.80	36.00
NE 8745	0.70	14.00	1.20	24.00	NE 9847	1.30	26.00	1.80	36.00
NE 8747	0.70	14.00	1.20	24.00	NE 9850	1.30	26.00	1.80	36.00
NE 8750	0.70	14.00	1.20	24.00					
					NE 9912	1.20	24.00	1.55	31.00
NE 9415	0.75	15.00	1.25	25.00	NE 9915	1.20	24.00	1.55	31.00
NE 9417	0.75	15.00	1.25	25.00	NE 9917	1.20	24.00	1.55	31.00
NE 9420	0.75	15.00	1.25	25.00	NE 9920	1.20	24.00	1.55	31.00
NE 9422	0.75	15.00	1.25	25.00	NE 9922	1.20	24.00	1.55	31.00
NE 9425	0.75	15.00	1.25	25.00	NE 9925	1.20	24.00	1.55	31.00

Note 1: The ranges shown are restricted to sizes 100 sq. in. or less or equivalent cross-sectional area 18 in. wide or under, with a maximum individual piece weight of 7000 lb. irrespective of size. **Note 2:** For steels ordered to such ranges, below the size and weight restriction, the average of all the chemical checks must be within the limits specified subject to check analysis variations given in Table 4, Section 10, AISI Steel Products Manual. **Note 3:** When acid open-hearth is specified and acceptable, add to basic open-hearth alloy differential 0.25c. per lb. for bars and bar strip and $5 per gross ton for billets, blooms and slabs. **Note 4:** The extras shown are in addition to the base price of $2.70 for 100 lb. on finished products and $54 per gross ton on semi-finished steel, major basing points, and are in cents per pound when applicable to bars and bar-strip and in dollars per gross ton when applicable to billets, blooms and slabs. The full extra applicable over the base price is the total of all extras indicated by the specific requirements of the order. The higher extra shall be charged for any size falling between two published extras.

BASE QUANTITIES

Standard unless otherwise keyed on prices.

HOT ROLLED: Sheets, strip, plates, shapes and bars, 400 to 1999 lb.

COLD ROLLED: Sheets, 400 to 1499 lb.; strip, extras on all quantities; bars, 1500 lb. base; NE alloy bars, 1000 to 39,999 lb.

EXCEPTIONS: (1) 150 to 499 lb. (2) 150 to 1499 lb. (3) 400 to 1499 lb. (4) 450 to 1499 lb. (5) 500 to 1499 lb. (6) 0 to 199 lb. (7) 400 to 1499 lb. (8) 1000 to 1999 lb. (9) 450 to 3749 lb. (10) 400 to 3999 lb. (11) 300 to 4999 lb. (12) 800 to 10,000 lb. (13) 400 to 14,999 lb. (14) 400 lb. and over. (15) 1000 lb. and over. (16) 1500 lb. and over. (17) 2000 lb. and over. (18) 3500 lb. and over.

(a) Philadelphia: Galvanized sheet, 25 or more bundles.

Extra for size, quality, etc., apply on above quotations.

*Add 0.271c. for sizes not rolled in Birmingham.

**City of Philadelphia only. Applicable freight rates must be added to basing point prices to obtain delivered price to other localities in metropolitan area.

LAKE SUPERIOR ORES

(51.50% *Fe, Natural Content, Delivered Lower Lake Ports**)

	Per Gross Ton
Old range, bessemer, 51.50	$4.75
Old range, non-bessemer, 51.50	4.60
Mesaba, bessemer, 51.50	4.60
Mesaba, non-bessemer, 51.50	4.45
High phesphorus, 51.50	4.35

*Adjustments are made to indicate prices based on variance of Fe content of ores as analyzed on a dry basis by independent laboratories.

FLUORSPAR

Maximum price f.o.b. consumer's plant, $30 per short ton plus either (1) rail freight from producer to consumer, or (2) rail freight from Rosiclare, Ill., to consumer, whichever is lower.

Exception

When the WPB Steel Division certifies in writing the consumer's need for one of the higher grades of metallurgical fluorspar specified in the table below the price shall be taken from the table plus items (1 and 2) from paragraph above.

Effective CaF_2 Content:	*Base price per short ton*
70% or more	$33.00
65% but less than 70%	32.00
60% but less than 65%	31.00
Less than 60%	30.00

PRICES

BOLTS, NUTS, RIVETS, SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

Machine and Carriage Bolts:

Base discount less case lots

	Per Cent Off List
3/16 & 5/16 in. x 6 in. & shorter	63½
½ in. & smaller x 6 in. & shorter	65½
¾ to 1 in. x 6 in. & shorter	61
1½ in. and larger, all lengths	59
All diameters over 6 in. long	59
Lag, all sizes	62
Plow bolts	65

Nuts, Cold Punched or Hot Pressed

(Hexagon or Square)

½ in. and smaller	62
9/16 to 1 in. inclusive	59
1⅛ to 1½ in. inclusive	57
1⅝ in. and larger	56

On above bolts and nuts, excepting plow bolts, additional allowance of 10 per cent for full container quantities. There is an additional 5 per cent allowance for carload shipments.

Semi-Fin. Hexagon Nuts	U.S.S.	S.A.E.
Base discount less keg lots		
7/16 in. and smaller	..	64
½ in. and smaller	62	..
½ in. through 1 in.	..	60
9/16 in. through 1 in.	59	..
1⅛ in. through 1½ in.	57	58
1⅝ in. and larger	56	..

In full keg lots, 10 per cent additional discount.

Stove Bolts	*Consumer*
Packages, nuts loose	71 and 10
In packages, with nuts attached	71
In bulk	80

On stove bolts freight allowed up to 35c. per 100 lb. based on Cleveland, Chicago, New York on lots of 200 lb. or over.

Large Rivets

(½ in. and larger)

	Base per 100 Lb.
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	$3.75

Small Rivets

(7/16 in. and smaller)

	Per Cent Off List
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	65 and 5

Cap and Set Screws	*Consumer Per Cent Off List*
Upset full fin, hexagon head cap screws, coarse or fine thread, up to and incl. 1 in. x 6 in.	64
Upset set screws, cup and oval points	71
Milled studs	46
Flat head cap screws, listed sizes	36
Fillister head cap, listed sizes	51

Freight allowed up to 65c. per 100 lb. based on Cleveland, Chicago or New York on lots of 200 lb. or over.

ROOFING TERNE PLATE

(F.o.b. Pittsburgh, 112 Sheets)

	20x14 in.	20x28 in.
3-lb. coating I.C.	$6.00	$12.00
15-lb. coating I.C.	7.00	14.00
20-lb. coating I.C.	7.50	15.00

ELECTRICAL SHEETS

(Base, f.o.b. Pittsburgh)

	Per Lb.
Field grade	3.30c.
Armature	3.65c.
Electrical	4.15c.
Motor	5.05c.
Dynamo	5.75c.
Transformer 72	6.25c.
Transformer 65	7.25c.
Transformer 58	7.75c.
Transformer 52	8.55c.

F.o.b. Granite City, add 10c. per 100 lb. on field grade to and including dynamo. Pacific ports add 75c. per 100 lb. on all grades.

PRICES

WELDED PIPE AND TUBING

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

(F.o.b. Pittsburgh only on wrought pipe)
Base Price—$200.00 per Net Ton

	Black	Galv.
Steel (Butt Weld)		
½ in.	63½	51
¾ in.	66½	55
1 to 3 in.	68½	57½
Wrought Iron (Butt Weld)		
½ in.	24	3½
¾ in.	30	10
1 and 1¼ in.	34	16
1½ in.	38	18½
2 in.	37½	18
Steel (Lap Weld)		
2 in.	61	49½
2½ in. and 3 in.	64	52½
3½ to 6 in.	66	54½
Wrought Iron (Lap Weld)		
2 in.	30½	13
2½ to 3½ in.	31½	14½
4 in.	33½	18
4½ to 8 in.	32½	17
Steel (Butt, extra strong, plain ends)		
½ in.	61½	50½
¾ in.	65½	54½
1 to 3 in.	67	57
Wrought Iron (Same as Above)		
½ in.	25	6
¾ in.	31	12
1 to 2 in.	38	19½
Steel (Lap, extra strong, plain ends)		
2 in.	59	48½
2½ and 3 in.	63	52½
3½ to 6 in.	66½	56
Wrought Iron (Same as Above)		
2 in.	33½	15½
2½ to 4 in.	39	22½
4½ to 6 in.	37½	21

On butt weld and lap weld steel pipe jobbers are granted a discount of 5%. On less-than-carload shipments prices are determined by adding 25 and 30% and the carload freight rate to the base card.

F.o.b. Gary prices are two points lower discount or $4 a ton higher than Pittsburgh or Lorain on lap weld and one point lower discount, or $2 a ton higher on all butt weld.

CAST IRON WATER PIPE

	Per Net Ton
6-in. and larger, del'd Chicago	$54.80
6-in. and larger, del'd New York	53.20
6 in. and larger, Birmingham	46.00
6-in. and larger f.o.b. cars, San Francisco or Los Angeles	69.40
6-in. and larger f.o.b. cars, Seattle	71.20

Class "A" and gas pipe, $3 extra; 4-in. pipe is $3 a ton above 6-in. Prices shown are for lots of less than 200 tons. For 200 tons or over, 6-in. and larger are $45 at Birmingham and $53.80 delivered Chicago, $59.40 at San Francisco and Los Angeles, and $70.20 at Seattle. Delivered prices do not reflect new 3 per cent tax on freight rates.

BOILER TUBES

Seamless Steel and Lap Weld Commercial Boiler Tubes and Locomotive Tubes, Minimum Wall. Net base prices per 100 ft. f.o.b. Pittsburgh, in carload lots.

	Seamless Cold Drawn	*Hot Rolled*	*Lap Weld, Hot Rolled*
2 in. o.d. 13 B.W.G.	15.03	13.04	12.38
2½ in. o.d. 12 B.W.G.	20.21	17.54	16.58
3 in. o.d. 12 B.W.G.	22.48	19.50	18.35
3½ in. o.d. 11 B.W.G.	28.37	24.62	23.15
4 in. o.d. 10 B.W.G.	35.20	30.54	28.66

(Extras for less carload quantities)

40,000 lb. or ft. and over	Base
30,000 lb. or ft. to 39,999 lb. or ft.	5%
20,000 lb. or ft. to 29,999 lb. or ft.	10%
10,000 lb. or ft. to 19,999 lb. or ft.	20%
5,000 lb. or ft. to 9,999 lb. or ft.	30%
2,000 lb. or ft. to 4,999 lb. or ft.	45%
Under 2,000 lb. or ft.	65%

PRICES

CORROSION AND HEAT-RESISTING STEEL

(Per lb. base price, f.o.b. Pittsburgh)

Chromium-Nickel Alloys

	No. 304	No. 302
Forging billets	21.25c.	20.40c.
Bars	25.00c.	24.00c.
Plates	29.00c.	27.00c.
Structural shapes	25.00c.	24.00c.
Sheets	36.00c.	34.00c.
Hot rolled strip	23.50c.	21.50c.
Cold rolled strip	30.00c.	28.00c.
Drawn wire	25.00c.	24.00c.

Straight-Chromium Alloys

	No. 410	No. 430	No. 442	No. 446
F.Billets	15.725c.	16.15c.	19.125c.	23.375c.
Bars	18.50c.	19.00c.	22.50c.	27.50c.
Plates	21.50c.	22.00c.	25.50c.	30.50c.
Sheets	26.50c.	29.00c.	32.50c.	36.50c.
Hot strip	17.00c.	17.50c.	24.00c.	35.00c.
Cold strip	22.00c.	22.50c.	32.00c.	52.00c.

Chromium-Nickel Clad Steel (20%)

	No. 304
Plates	18.00c.*
Sheets	19.00c.

*Includes annealing and pickling.

REFRACTORIES

(F.o.b. Works)

Fire Clay Brick

	Per 1000
Super-duty brick, St. Louis	$66.55
First quality, Pa., Md., Ky., Mo., Ill.	52.85
First quality, New Jersey	57.70
Sec. quality, Pa., Md., Ky., Mo., Ill.	47.95
Sec. quality, New Jersey	52.55
No. 1 Ohio	44.30
Ground fire clay, net ton	7.80

Silica Brick

Pennsylvania and Birmingham	$52.85
Chicago District	60.65
Silica cement, net ton (Eastern)	9.25

Chrome Brick

	Per Net Ton
Standard chemically bonded, Balt., Plymouth Meeting, Chester	$54.00

Magnesite Brick

Standard, Balt. and Chester	$76.00
Chemically bonded, Baltimore	65.00

Grain Magnesite

Domestic, f.o.b. Balt. and Chester in sacks (carloads)	$43.48
Domestic, f.o.b. Chewelah, Wash. (in bulk)	22.00

EXCEPTIONS TO RPS 6

Ingots, carbon, rerolling—Phoenix Iron Co. may charge $38.75; Kaiser Co., $43.00 f.o.b. Pacific Coast ports; Empire Sheet & Tinplate Co., $34.25; Pgh. Steel Co., $33.10.

Ingots, carbon, forging—Phoenix Iron Co. may charge $43.00; Empire Sheet & Tinplate Co., $39.25. f.o.b. Mansfield, Ohio; West Coast producers, $48.00, f.o.b. Pacific Coast Ports; Pgh. Steel Co., $38.10.

Ingots, alloy—C/l delivered Detroit add $2.00; delivered East Michigan add $3.00. Connors Steel Co. may charge $45.00 f.o.b. Birmingham.

Slabs, per gross ton—Andrews Steel Co. $41 basing pts.; Wheeling Steel Corp. (rerolling) 4 in. sq. or larger $37.75 f.o.b. Portsmouth, Ohio; Empire Sheet & Tin Plate Corp. $41; Phoenix Iron Co. (rerolling) $41, (forging) $47; Granite City Steel $47.50; Kaiser Co., (rerolling) $58.64, (forging) $64.64, f.o.b. Los Angeles.

Blooms, per gross ton—Phoenix Iron Co. (rerolling) $41; (forging) $47; Pgh. Steel Co. (rerolling) $38.25, (forging) $44.25; Wheeling Steel Corp. (rerolling) 4 in. sq. or larger $37.75 f.o.b. Portsmouth; Kaiser Co. (rerolling) $58.64, (forging) $64.64 (shell steel) $74.64 f.o.b. Los Angeles.

Sheet Bar, per gross ton—Empire Sheet & Tinplate Co. $39 mill; Wheeling Steel Corp. $38 Portsmouth, Ohio.

Billets, Forging, per gross ton—Andrews Steel Co. $50 basing pts.; Follansbee Steel Corp. $49.50 Toronto, Ohio; Phoenix Iron Co. $47 mill; Geneva Steel Co. $64.64 f.o.b. Pacific Coast; Pittsburgh Steel Co. $49.50; Kaiser Co. $64.64, (shell steel) $74.64, f.o.b. Los Angeles.

BASING POINT* BASE PRICES

Basing Point	Basic	No. 2 Foundry	Malleable	Bessemer	Low Phos.
Bethlehem	$25.50	$26.00	$26.50	$27.00	.....
Birdsboro	25.50	26.00	26.50	27.00	$30.50
Birmingham	20.00	21.38	.....	26.00	.....
Buffalo	24.00	25.00	25.50	26.00	30.50
Chicago	24.50	25.00	25.00	25.50	.....
Cleveland	24.50	25.00	25.00	25.50	.....
Detroit	24.50	25.00	25.00	25.50	.....
Duluth	25.00	25.50	25.50	26.00	.....
Erie	24.50	25.00	25.50	26.00	.....
Everett	25.50	26.00	26.50	27.00	.....
Granite City	24.50	25.00	25.00	25.50	.....
Hamilton	24.50	25.00	25.00	.....	.....
Neville Island	24.50	25.00	25.00	25.50	.....
Provo	22.50	23.00	.....	.....	.....
Sharpsville [1]	24.50	25.00	25.00	25.50	.....
Sparrows Point	25.50	26.00	.....	.....	.....
Steelton	25.50	.....	.....	.....	30.50
Swedeland	25.50	26.00	26.50	27.00	.....
Toledo	24.50	25.00	25.00	25.50	.....
Youngstown	24.50	25.00	25.00	25.50	.....

DELIVERED PRICES† (BASE GRADES)

Consuming Point	Basing Point	Freight Rate	Basic	No. 2 Foundry	Malleable	Bessemer	Low Phos.
Boston	Everett	$ .50	$26.00	$26.50	$27.00	$27.50	.....
Boston	Birdsboro-Steelton	4.02	.....	.....	.....	.....	$34.52
Brooklyn	Bethlehem	2.50	28.00	28.50	29.00	29.50	.....
Brooklyn	Birdsboro	2.92	.....	.....	.....	.....	33.42
Canton	Cleveland	1.39	25.89	26.39	26.39	26.89	.....
Canton	Buffalo	3.19	.....	.....	.....	.....	33.69
Cincinnati	Birmingham	4.06	24.06	25.44	.....	.....	.....
Cincinnati	Hamilton	1.11	.....	.....	26.11	.....	.....
Cincinnati	Buffalo	4.40	.....	.....	.....	.....	34.90
Jersey City	Bethlehem	1.53	27.03	27.53	28.03	28.53	.....
Jersey City	Birdsboro	1.94	.....	.....	.....	.....	32.44
Los Angeles	Provo	4.95	27.45	27.95	.....	.....	.....
Los Angeles	Buffalo	15.41	.....	.....	.....	.....	45.91
Mansfield	Cleveland & Toledo	1.94	26.44	26.94	26.94	27.44	.....
Mansfield	Buffalo	3.36	.....	.....	.....	.....	33.86
Philadelphia	Swedeland	.84	26.34	26.84	27.34	27.84	.....
Philadelphia	Birdsboro	1.24	.....	.....	.....	.....	31.74
San Francisco	Provo	4.95	27.45	27.95	.....	.....	.....
San Francisco	Buffalo	15.41	.....	.....	.....	.....	45.91
Seattle	Provo	4.95	27.45	27.95	.....	.....	.....
Seattle	Buffalo	15.41	.....	.....	.....	.....	45.91
St. Louis	Granite City	.50	25.00	25.50	25.50	26.00	.....
St. Louis	Buffalo	7.07	.....	.....	.....	.....	37.57

* Maximum per gross ton, established by OPA February 14, 1945. † Prices do not reflect 3 per cent tax on freight.

(1) Struthers Iron & Steel Co., Struthers, Ohio, may charge 50c. a ton in excess of basing point prices for No. 2 foundry, basic, bessemer and malleable.

Charcoal pig iron base prices for Lyles, Tenn., and Lake Superior furnaces, $33.00 and $34.00, respectively. Newberry Brand of Lake Superior charcoal iron $39.00 per g.t., f.o.b. furnace, by order L 39 to RPS 10, April 11, 1945, retroactive to March 7, 1945. Delivered to Chicago, $42.34. High phosphorus iron sells at Lyles, Tenn., at $28.50.

Basing point prices are subject to switching charges; Silicon differentials (not to exceed 50c. a ton for each 0.25 per cent silicon content in excess of base grade which is 1.75 to 2.25 per cent); Phosphorus differentials, a reduction of 38c. per ton for phosphorus content of 0.70 per cent and over; Manganese differentials, a charge not to exceed 50c. per ton for each 0.50 per cent manganese content in excess of 1.00 per cent. Effective March 3, 1943, $2 per ton extra may be charged for 0.5 to 0.75 per cent nickel content and $1 per ton extra for each additional 0.25 per cent nickel.

Silvery iron and bessemer ferrosilicon up to and including 14.00 per cent silicon covered by RPS 10 as amended Feb. 14, 1945. Silvery iron, silicon 6.00 to 6.50 per cent, C/L per G.T., f.o.b. Jackon, Ohio—$30.50; f.o.b. Buffalo—$31.75. Add $1.00 per ton for each additional 0.50% Si. Add 50c. per ton for each 0.50% Mn over 1.00%. Add $1.00 per ton for 0.75% or more P. Bessemer ferrosilicon prices are $1.00 per ton above silvery iron prices of comparable analysis.

METAL POWDERS

Prices are based on current market prices of ingots plus a fixed figure. F.o.b. shipping point, c. per lb., ton lots.

Copper, electrolytic, 150 and 200 mesh	21½ to 23½c.
Copper, reduced, 150 and 200 mesh	20½ to 25½c.
Iron, commercial, 100 and 200 mesh 96 + % Fe	12½ to 15c.
Iron, crushed, 200 mesh and finer, 90 + % Fe, carload lots	4c.
Iron, hydrogen reduced, 300 mesh and finer, 98½ + % Fe, drum lots	63c.
Iron, electrolytic, unannealed, 300 mesh and coarser, 99 + % Fe	30 to 33c.
Iron, electrolytic, annealed minus 100 mesh, 99 + % Fe	42c.
Iron, carbonyl, 300 mesh and finer, 98-99.8 + % Fe	90c.
Aluminum, 100 and 200 mesh	*23 to 27c.
Antimony, 100 mesh	20.6c.
Cadmium, 100 mesh	$1
Chromium, 150 mesh	$1.03
Lead, 100, 200 & 300 mesh	11½ to 12½c.
Manganese, 150 mesh	51c.
Nickel, 150 mesh	51½c.
Solder powder, 100 mesh	8½c. plus metal
Tin, 100 mesh	58¾c.
Tungsten metal powder, 98%-99%, any quantity, per lb.	$2.60
Molybdenum powder, 99%, in 200-lb. kegs, f.o.b. York, Pa., per lb.	$2.60
Under 100 lb.	$3.00

*Freight allowed east of Mississippi.

COKE

	Net Ton
Furnace, beehive (f.o.b. oven)	
Connellsville, Pa.	$7.50*
Foundry, beehive (f.o.b. oven)	
Fayette Co., W. Va.	8.10
Connellsville, Pa.	9.00
Foundry, By-Product	
Chicago, del'd	13.35
Chicago, f.o.b.	12.60
New England, del'd	14.25
Kearny, N. J., f.o.b.	12.65
Philadelphia, del'd	12.88
Buffalo, del'd	13.00
Portsmouth, Ohio, f.o.b.	11.10
Painesville, Ohio, f.o.b.	11.75
Erie, del'd	12.75
Cleveland, del'd	12.80
Cincinnati, del'd	12.85
St. Louis, del'd	13.35
Birmingham, del'd	10.50

*Hand drawn ovens using trucked coal permitted to charge $8.00 per ton plus transportation charges.

PRICES

Billets, Rerolling, per gross ton—Continental Steel Corp. may charge Acme Steel in Chicago switching area $34 plus freight from Kokomo, Ind.; Northwestern Steel & Wire Co. (Lend-Lease) $41 mill; Wheeling Steel Corp. 4 in. sq. or larger $37.75, smaller $39.50 f.o.b. Portsmouth, Ohio; Stanley Works may sell Washburn Wire Co. under allocation at $39 Bridgeport, Conn.; Keystone Steel & Wire Co. may sell Acme Steel Co. at Chicago base, f.o.b. Peoria; Phoenix Iron Co. $41 mill; Continental Steel Corp. (1¾ x 1¾) $39.50, (2 x 2) $40.60 Kokomo, Ind. (these prices include $1 size extra); Keystone Steel & Wire Co. $36.40 Peoria; Connors Steel Co. $50.60 Birmingham; Ford Motor Co. $34 Dearborn, Mich.; Geneva Steel Co. $58.64 f.o.b. Pacific Coast; Pgh. Steel Co. $43.50; Kaiser Co. $58.64 f.o.b. Los Angeles.

Structural Shapes—Phoenix Iron Co. 2.35c. basing pts. (export) 2.50c. Phoenixville; Knoxville Iron Co. 2.30c. basing points; Kaiser Co. 3.20c. f.o.b. Los Angeles.

Rails, per gross ton—Sweet Steel Co. (rail steel) $50 mill; West Virginia Rail Co. (lightweight) on allocation based Huntington, W. Va.; Colorado Fuel & Iron, $45 Pueblo.

Hot Rolled Plate—Granite City Steel Co. 2.65c. mill; Knoxville Iron Co. 2.25c. basing pts.; Kaiser Co. and Geneva Steel Co. 3.20c. Pacific Ports; Central Iron and Steel Co. 2.50c. basing points; Granite City Steel Co. 2.35c. Granite City.

Merchant Bars—W. Ames Co., 10 tons and over, 2.85c. mill; Eckels-Nye Steel Corp. 2.50c. basing pts. (rail steel) 2.40c.; Phoenix Iron Co. 2.40c. basing pts.; Sweet Steel Co. (rail steel) 2.33c. mill; Joslyn Mfg. & Supply Co., 2.35c. Chicago; Calumet Steel Div., Borg Warner Corp. (8 in. mill bar), 2.35c. Chicago; Knoxville Iron Co., 2.30c. basing pts.; Laclede Steel Co., sales to LaSalle Steel granted Chicago base, f.ob Madison, Ill.; Milton Mfg. Co., 2.75c. f.o.b. Milton, Pa.

Pipe Skelp—Wheeling Steel, Benwood, 2.05c.

Reinforcing Bars—W. Ames & Co., 10 tons and over, 2.85c. mill; Sweet Steel Co. (rail steel), 2.33c. mill; Columbia Steel Co., 2.50c. Pacific Ports.

Cold Finished Bars—Keystone Drawn Steel Co. on allocation, Pittsburgh c.f. base plus c/l freight on hot rolled bars Pittsburgh to Spring City, Pa.; New England Drawn Steel Co. on allocation outside New England, Buffalo c.f. base plus c/l freight Buffalo to Mansfield, Mass., f.o.b. Mansfield; Empire Finished Steel Corp. on allocation outside New England, Buffalo c.f. base plus c/l freight Buffalo to plants, f.o.b. plant; Compressed Steel Shafting Co. on allocation outside New England, Buffalo base plus c/l freight Buffalo to Readville, Mass., f.o.b. Readville; Medart Co. in certain areas, Chicago c.f. base plus c/l freight Chicago to St. Louis, f.o.b. St. Louis.

Alloy Bars—Texas Steel Co., for delivery except Texas and Okla., Chicago base, f.o.b. Fort Worth, Tex.; Connors Steel Co., shipped outside Ala., Mississippi, Louisiana, Georgia, Florida, Tenn., Pittsburgh base, f.o.b. Birmingham.

Hot Rolled Strip—Joslyn Mfg. & Supply Co., 2.30c. Chicago; Knoxville Iron Co., 2.25c. basing pts.

Hot Rolled Sheets—Andrews Steel Co., Middletown base on shipments to Detroit or area; Parkersburg Iron & Steel, 2.25c. Parkersburg.

Galvanized Sheets—Andrews Steel Co. 3.75c. basing pts.; Parkersburg Iron & Steel Co., 3.85c. Parkersburg; Continental Steel Co., Middletown base on Kokomo, Ind., product; Superior Sheet Steel Co., Pittsburgh base except for Lend-Lease.

Pipe and Tubing—South Chester Tube Co. when priced at Pittsburgh, freight to Gulf Coast and Pacific Ports may be charged from Chester, Pa., also to points lying west of Harrisburg, Pa.

Black Sheets—Empire Sheet and Tinplate Co., maximum base price mill is 2.45c. per 100 lb., with differentials, transportation charges, etc., provided in RPS. No. 6.

Wire Products—Pittsburgh Steel Co., f.o.b. Pittsburgh, per 100 lb., rods, No. 5 to 9/32 in., 2.20c.; rods, heavier than 9/32, 2.35c.; bright wire, 2.725c.; bright nails, 2.90c.; lead and furnace annealed wire, 2.85c.; pot annealed wire, 2.85c.; galvanized barbed wire, 3.90c.; plain staples, 2.55c.; galvanized staples, 2.65c.; bright spring wire, 3.30c.; galvanized spring wire, 3.45c.

FERROALLOY PRICES

Ferromanganese

78-82% Mn, maximum contract base price per gross ton, lump size, f.o.b. car at Baltimore, Philadelphia, New York, Birmingham, Rockdale, Rockwood, Tenn.

Carload lots (bulk)	$135.00
Carload lots (packed)	141.00
Less ton lots (packed)	148.50

$1.70 for each 1% above 82% Mn; penalty, $1.70 for each 1% below 78%.

Manganese Metal

Contract basis, lump size, per lb. of metal, f.o.b. shipping point with freight allowed. Spot sales add 2c. per lb.

96-98% Mn, .2% max. C, 1% max. Si, 2% max. Fe.

Carload, bulk	36c.
L.c.l. lots	38c.

95-97% Mn, .2% max. C, 1.5% max. Si, 2.5% max. Fe.

Carload, bulk	34c.
L.c.l. lots	35c.

Spiegeleisen

Maximum base, contract prices, per gross ton, lump, f.o.b. Palmerton, Pa.

	16-19% Mn 3% max. Si	19-21% Mn 3% max. Si
Carloads	$35.00	$36.00
Less ton	47.50	48.50

Electric Ferrosilicon

OPA maximum base price cents per lb. contained Si, lump size in carloads, f.o.b. shipping point with freight allowed.

	Eastern Zone	Central Zone	Western Zone
50% Si	6.65c.	7.10c.	7.25c.
75% Si	8.05c.	8.20c.	8.75c.
80-90% Si.	8.90c.	9.05c.	9.55c.
90-95% Si.	11.05c.	11.20c.	11.65c.

Spot sales add: 45c. per lb. for 50% Si, .3c. per lb. for 75% Si, .25c. per lb. for 80-90% and 90-95% Si.

Silvery Iron

Silvery Iron, Silicon 14.01 to 14.50 per cent, $45.50 per G. T. f.o.b. Jackson, Ohio. Add $1.00 per ton for each additional 0.50% Si up to and including 18%. Add $1.00 per ton for low impurities, not to exceed: P—0.05%, S—0.04%, C—1.00%. Covered by MPR 405.

Silicon Metal

OPA maximum base price per lb. of contained Si, lump size, f.o.b. shipping point with freight allowed to destination, for l.c.l. above 2000 lb., packed. Add .25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
96% Si, 2% Fe.	13.10c.	13.55c.	16.50c.
97% Si, 1% Fe.	13.45c.	13.90c.	16.80c.

Ferrosilicon Briquets

OPA maximum base price per lb. of briquet, bulk, f.o.b. shipping point with freight allowed to destination. Approximately 40% Si. Add .25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
Carload, bulk	3.35c.	3.50c.	3.65c.
2000 lb-carload	3.8c.	4.2c.	4.25c.

Silicomanganese

Contract basis lump size, per lb. of metal, f.o.b. shipping point with freight allowed. Add .25c. for spot sales. 65-70% Mn, 17-20% Si, 1.5% max. C.

Carload, bulk	6.05c.
2000 lb. to carload	6.70c.
Under 2000 lb.	6.90c.
Briquets, contract, basis carlots, bulk freight allowed, per lb.	5.80c.
2000 lb. to carload	6.30c.
Less ton lots	6.55c.

Ferrochrome

(65-72% Cr. 2% max. Si)

OPA maximum base contract prices per lb. of contained Cr, lump size in carload lots, f.o.b. shipping point, freight allowed to destination. Add .25c. per lb. contained Cr for spot sales.

	Eastern Zone	Central Zone	Western Zone
0.06% C	23.00c.	23.40c.	24.00c.
0.10% C	22.50c.	22.90c.	23.50c.
0.15% C	22.00c.	22.40c.	23.00c.
0.20% C	21.50c.	21.90c.	22.50c.
0.50% C	21.00c.	21.40c.	22.00c.
1.00% C	20.50c.	20.90c.	21.50c.
2.00% C	19.50c.	19.90c.	21.00c.
66-71% Cr, 4-10%	13.00c.	13.40c.	14.00c.
62-66% Cr, 5-7% C	13.50c.	13.90c.	14.50c.

High-Nitrogen Ferrochrome

Low-carbon type: 67-72% Cr, 0.75% N. Add 2c. per lb. to regular low-carbon ferrochrome price schedule. Add 2c. for each additional 0.25% N. High-carbon type: 66-71% Cr, 4-5% C, 0.75% N. Add 5c. per lb. to regular high-carbon ferrochrome price schedule.

Low-Carbon Ferromanganese

Contract prices per lb. of manganese contained, lump size, f.o.b. shipping point, freight allowed to destination, Eastern Zone. Add 0.25c. for spot sales.

	Carloads, Ton Bulk	Lots	Less Ton
0.10% max. C, 1 or 2% max. Si.	23.00c.	23.40c.	23.65c.
0.15% max. C, 1 or 2% max. Si.	22.00c.	22.40c.	22.65c.
0.30% max. C, 1 or 2% max. Si.	21.00c.	21.40c.	21.65c.
0.50% max. C, 1 or 2% max. Si.	20.00c.	20.40c.	20.65c.
0.75% max. C, 7.00% max. Si.	16.00c.	16.40c.	16.65c.

Ferrochrome Briquets

Contract prices per lb. of briquet, f.o.b. shipping point, freight allowed to destination. Approx. 60 per cent contained chromium. Add 0.25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
Carload, bulk	8.25c.	8.55c.	8.95c.
Ton lots	8.75c.	9.25c.	10.75c.
Less ton lots	9.00c.	9.50c.	11.00c.

Ferromanganese Briquets

Contract prices per lb. of briquet, f.o.b. shipping point, freight allowed to destination. Approx. 66 per cent contained manganese. Add 0.25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
Carload, bulk	6.05c.	6.30c.	6.60c.
Ton lots	6.65c.	7.55c.	8.55c.
Less ton lots	6.80c.	7.80c.	8.80c.

Calcium—Manganese—Silicon

Contract prices per lb. of alloy, lump size, f.o.b. shipping point, freight allowed to destination.

16-20% Ca, 14-18% Mn, 53-59% Si. Add 0.25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
Carloads	15.50c.	16.00c.	18.05c.
Ton lots	16.50c.	17.35c.	19.10c.
Less ton lots	17.00c.	17.35c.	19.60c.

Calcium Metal

Eastern zone contract prices per lb. of metal, f.o.b. shipping point, freight allowed to destination. Add 5c. for spot sales. Add 0.9c. for Central Zone; 0.49c. for Western Zone.

	Cast	Turnings	Distilled
Ton lots	$1.80	$2.30	$5.00
Less ton lots	2.30	2.80	5.75

Chromium—Copper

Contract price per lb. of alloy, f.o.b. Niagara Falls, freight allowed east of the Mississippi River. 8-11% Cr, 88-90% Cu, 1.00% max. Fe, 0.50% max. Si. Add 2c. for spot sales.

Shot or ingot	45c.

Ferroboron

Contract prices per lb. of alloy, f.o.b. shipping point, freight allowed to destination. Add 5c. for spot sales. 17.50% min. B, 1.50% max. Si, 0.50% max. Al, 0.50% max. C.

	Eastern Zone	Central Zone	Western Zone
Ton lots	$1.20	$1.2075	$1.229
Less ton lots	1.30	1.3075	1.329

Manganese—Boron

Contract prices per lb. of alloy, f.o.b. shipping point, freight charges allowed. Add 5c. for spot sales.

75.00% Mn, 15-20% B, 5% max. Fe, 1.50% max. Si, 3.00% max. C.

	Eastern Zone	Central Zone	Western Zone
Ton lots	$1.89	$1.903	$1.935
Less ton lots	2.01	2.023	2.055

Nickel—Boron

Spot and contract prices per lb. of alloy, f.o.b. shipping point, freight allowed to destination.

15-18% B, 1.00% max. Al, 1.50% max. Si, 0.50% max. C, 3.00% max. Fe, balance Ni.

	Eastern Zone	Central Zone	Western Zone
11,200 lb. or more	$1.90	$1.9125	$1.9445
Ton lots	2.00	2.09125	2.0445
Less ton lots	2.10	2.1125	2.1445

PRICES

Other Ferroalloys

Ferrotungsten, Standard grade lump or ¼X down, packed, f.o.b. plant at Niagara Falls, New York, Washington, Pa. York, Pa., per lb. contained tungsten, 10,000 lb. or more....	$1.90
Ferrovanadium, 35-55%, contract basis, f.o.b. producer's plant, usual freight allowances, per lb. contained Va.	
Open hearth	$2.70
Crucible	$2.80
Primos	$2.90
Cobalt, 97% min., keg packed, contract basis, f.o.b. producer's plant, usual freight allowances, per lb. of cobalt metal.....	$1.50
Vanadium pentoxide, 88-92% V_2O_5 technical grade, contract basis, any quantity, per lb. contained V_2O_5. Spot sales add 5c. per lb. contained V_2O_5.....	$1.10
Silcaz No. 3, contract basis, f.o.b. producer's plant with usual freight allowances, per lb. of alloy. (Pending OPA approval)	
Carload lots	25c.
2000 lb. to carload.....	26c.
Silvaz No. 3, contract basis, f.o.b. producer's plant with freight allowances, per lb. of alloy (Pending OPA approval)	
Carload lots	58c.
2000 lb. to carload.....	59c.
Grainal, f.o.b. Bridgeville, Pa., freight allowed 50 lb. and over, max. based on rate to St. Louis	
No. 1	87.5c.
No. 6	60c.
No. 79	45c.
Bortram, f.o.b. Niagara Falls	
Ton lots, per lb.....	45c.
Less ton lots, per lb.....	50c.
Ferrocolumbium, 50-60%, contract basis, f.o.b. plant with freight allowances, per lb. contained Cb.	
2000 lb. lots	$2.25
Under 2000 lb. lots.....	$2.30
Ferrotitanium, 40-45%, 0.10%C. max. f.o.b. Niagara Falls, N. Y., ton lots, per lb. contained Ti..	$1.23
Less ton lots.....	$1.25
Ferrotitanium, 20-25%, 0.10%C. max., ton lots, per lb. contained titanium	$1.35
Less ton lots.....	$1.40
High-carbon ferrotitanium, 15%-20%, 6-8% carbon, contract basis, f.o.b. Niagara Falls, N. Y. freight allowed East of Mississippi River, north of Baltimore and St. Louis, per carload.....	$142.50
Ferrophosphorus, 18% electric or blast furnaces, f.o.b. Anniston, Ala., carlots, with $3 unitage freight equalled with Rockdale, Tenn., per gross ton.....	58.50
Ferrophosphorus, electrolytic 23-26%, carlots, f.o.b. Monsanto (Siglo), Tenn., $3 unitage freight equalized with Nashville, per gross ton	$75.00
Ferromolybdenum, 55-75%, f.o.b. Langeloth, Washington, Pa., any quantity, per lb. contained Mo.	95c.
Calcium molybdate, 40-45%, f.o.b. Langeloth and Washington, Pa., any quantity, per lb. contained Mo.	80c.
Molybdenum oxide briquets, 48-52% Mo. f.ob. Langeloth, Pa. per lb. contained Mo.....	80c.
Molybdenum oxide, in cans, f.o.b Langeloth and Washington, Pa. per lb. contained Mo.....	80c.
Zirconium, 35-40%, contract basis, f.o.b. producer's plant with freight allowances, per lb. of alloy. Add ¼c. for spot sales	
Carload lots	14c.
Zirconium, 12-15%, contract basis, lump f.o.b. plant usual freight allowances, per lb. of alloy	
Carload, bulk	4.6c.
Alsifer (approx. 20% Al, 40% Si and 40% Fe), contract basis, f.o.b. Niagara Falls, carload, bulk	5.75c.
Ton lots	7.25c.
Simanal (approx. 20% Si, 20% Mn, 20% Al), contract basis, f.o.b. Philo, Ohio, with freight not to exceed St. Louis rate allowed, per lb.	
Car lots	8.00c.
Ton lots	8.75c.
Less ton lots	9.25c.

Target for Today

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